



SATURDAY, MAY 20, 1871.

COULTER'S SIGNAL BOX.

The engravings below are a perspective view and section of a signal-box invented by Mr. James P. Coulter, of Bloomington, Ill., and patented by him in December, 1869. The box is nine inches square at the bottom, four feet high, and the entire apparatus weighs sixty pounds. It is designed to be perched on a bracket or arm in front of the depot, so as to be distinctly visible to the engineer of an approaching train. Two cords, or chains, pass from the box to the telegraph office, and by means of these, respectively, the operator can unfurl a little flag from the box, or show a colored light, in both directions on the track, for day or night signals.

The chain for raising the flag passes up behind the signal-box, along the arm, A, and through the loop at the end of the arm, and is attached to the lid, B. The flag, E, is of the shape of the quadrant of a circle, and one side of it is attached to the side of the signal box. The other straight edge of the flag is fixed to the cone-shaped roller, R, and at the small end of the roller a toothed wheel gears to the curved rack, F, so that as the box lid is raised by the chain, the signal flag is unfurled and kept spread, so as to present its entire surface toward the approaching train. When the chain is released, the weight of the lid causes it to descend, and the flag is neatly rolled up.

In the lower box a kerosene lamp, Z, is surrounded by a cylindrical case, L, with openings at opposite sides corresponding to openings, D, in the side of the box. Fixed to the top of the case is a segmental rack, which gears to a fixed pinion at the end of the spool, S. The chain, V, one end of which is in the operator's room, passes down the box, around the spool, up again over the pulley, X, at the top of the box, and finally ends in its attachment to the weight, W. When the operator pulls this chain, the spool is revolved, and, by the action of the pinion in the curved rack, the lantern case is turned so as to set its openings to correspond with those in the side of the box, and allow the light to shine through the colored glass, D. The case is prevented from turning too far by lugs properly set, and, when the chain is released by the operator, the weight, W, turns the case back to such a position as to shut out the light.

The lamp rests on a metal strip which is arranged to be swung or drawn out at the bottom of the box when the lamp is to be filled or trimmed.

The Chicago & Alton Company used this signal box at various stations on their road for some time and finally ordered the entire line equipped with them. On this and other roads where they had a trial the superintendents, train dispatchers and engineers have been unanimous in their approval and appreciation. The flag works smoothly and the light is reliable, and the use of kerosene instead of lamp oil presents the advantage of furnishing a much stronger light and not requiring a trimming and pricking up of the wick.

Mr. Coulter wishes both to dispose of rights to railroad companies and to make arrangements with a manufacturer to manufacture the signals.

—An Englishman's risk of dying by strangulation is six times as great as of being killed on a railway, whether by his own carelessness or by an accident. If his own carelessness be excluded from the estimate, his risk of death by hanging is 130 times as great. Ninety-nine times as many people die of cancer in England as are killed on railways. Excluding, as before, the element of carelessness, 2,165 persons will die of cancer to one killed on a railway. In England during five years, 333 accidents occurred, 200 from collision, 77 from getting off the line, 36 from damage to machinery and 20 from other causes. For fourteen years, from 1855 to 1869, one person was killed in every 7,161,301 transported. In Prussia one is killed in 24,411,488, and one is injured in 3,892,998. The statistics of stage coaches in France, covering a period of ten years, show that one passenger in 355,463 is killed, and one in 29,871 is injured.

Contributions.

POWER REQUIRED TO MOVE THE SLIDE-VALVES OF STEAM ENGINES.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The problem alluded to in your leading editorial of April 29 is one of very great interest for all intelligent and progressive engineers, and the lame and impotent conclusion at which you have arrived is to be regretted. Differing in some respects from the statements made in that paper, with your permission I will give a few facts which have been ascertained in the course of a somewhat protracted investigation, hoping that others, more competent, may thereby be induced to shed more light on this, the most important question connected with a locomotive engine.

I deny, altogether, that the size of cylinder ports has anything whatever to do with pressure of steam on the slide-valve. Pressure is pressure—actual weight—whether of steam, air, or pig-iron. It is an actual, tan-

would then be as its area, and as the greater or less perfection of the vacuum created. It is so with a slide-valve, where two smooth surfaces are brought in contact, and where these surfaces are perfectly steam-tight, as they ought to be. The steam pressure is then altogether on the upper surface, and not at all below it. If not steam-tight, of course it is not so.

If the experiment has been tried, as you state, and failed, the failure has been altogether owing to the imperfect appliances used. Certainly nobody will deny that two and two make four, and that a pound or a ton weighs exactly that much, no more, no less. Pressure is only weight, and never will be anything else. There never can be and never will be any escape from this.

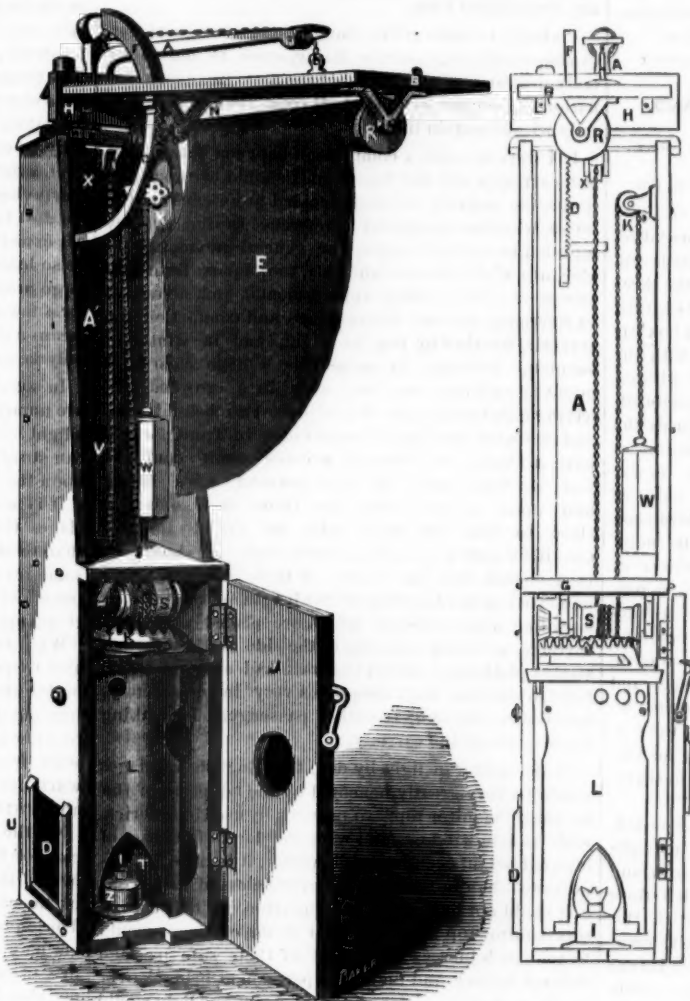
In the diagram you publish, the back pressure in the cylinder, of course, to a certain extent, counterbalances the boiler pressure on the valve. While this perhaps tends to move the valve easier, it is a still greater loss of engine power than the valve pressure, for the loss is duplicated, both below as well as above. This is not only no advantage but a still greater disadvantage than the original proposition. Exactly how much, it would be as hard to demonstrate as your dead weight and other conundrums which require actual tests to solve. This could easily be done with indicators and properly graduated brakes on a steam engine of known power.

Admitting these facts, it must be acknowledged that the slide-valve is a most crude, awkward and wasteful development of power. Yet this extravagant machine is that now universally used to propel all the trains on all the railways in the world. Any device or invention that will save a small per centage of power now lost must be of great interest to all engineers. But how much power is lost? Let us see, if we can.

Mr. W. A. Harris, of Providence, R. I., the well known builder of the Corliss engine, published a pamphlet last year complaining of the award made by the American Institute in 1869. On page 45 he gives an account of a competitive trial of one of his engines at Meriden, Connecticut, at the Britannia Company's works, with one of Lowe's engines. The two were of exactly the same bore of cylinder, but while the Lowe engine was only 100-horse power the Corliss was 150-horse power. This would seem to show that the latter had exactly 50 per cent. the advantage over the former. Extravagant as this may seem, and ready as engineers may be to deny it, the statement is nearer the truth than is generally supposed.

At a trial of these two engines, the Lowe engine, superintended by its builder, in 5 days rolled 1,248 plates of metal, with a consumption of 39,990 pounds of coal. The Corliss engine in 4 days rolled 1,532 of the same plates, with a consumption of 18,875 pounds of coal, or, to state the work done differently, in a single day the Corliss rolled 255 plates, burning 3,146 pounds of coal, while the Lowe engine rolled 175 plates and burned 5,408 pounds of fuel. Of three boilers required by the Lowe engine, the Corliss dispensed with one altogether, and still did more work. Exactly stated in decimals, the gain of the Corliss was 41.8 per cent.

But this trial is unsatisfactory in some respects. The Corliss engine may have been an unusually good one; the other may have been exactly the reverse. It is true that both builders were present, and probably did their best, both in furnishing good work and in managing skillfully. It would have been much more satisfactory if the same engine could have been used, the cut-offs or valves only being changed. This has recently been done, in testing a newly invented steam valve, at Burlington, Iowa. The paper mill at that place has a very fine Eastern-made slide-valve engine of 60-horse power. The slide-valve was taken off and the new one put on in its place, with results which surprised everybody. The mill had run last year with 80 to 100 pounds of steam, 50 pounds being required merely to move the machinery. With the new valve, 35 to 50 pounds was ample to do all the work. The proprietor reports that "the gain in power is fully one-third," which is a very moderate statement of the case. This engine has moved as well with 15 pounds of steam with the new valve, as it did before with fifty pounds. This valve is very simple in construction,



COULTER'S IMPROVED SIGNAL BOX.

gible fact, though somewhat more subtle and difficult to put the finger on, in one shape than another. Pile 100 or 130 pounds of pig-iron to the square inch of the upper superficial area of a slide-valve, and it could be so plainly seen that nobody could deny it. But as they do not see and feel that weight of steam, the doubting Thomases deny that it is there at all. Yet it may be proved in various ways. Take two perfectly true, smooth, non-porous surfaces, of metal or glass, well lubricated and worked together upon the surface, to expel all the air, and those two pieces cannot possibly be pulled apart, though they may be slipped one way or the other. The boy's toy known as the "sucker" will also prove it. This is made of a round piece of leather, with a hole punched in the middle, and a strong string passed through with a knot tied on the under side. Soak this in water and press it on the face of a smooth brick, without any hole whatever in it, so as to exclude the air, and the two will adhere so firmly that the brick may be swung round the boy's head. If the vacuum was perfect, the pressure of the leather to the brick would be exactly 15 pounds to the square inch of the superficial area of the sucker. It is really, of course, much less than that; for nothing is perfect in this world, not even a boy's sucker. The air in a perfectly air-tight vessel 10 or 100 feet in diameter, or more, might be extracted from it through a hole not so large as a goose-quill. The pressure on its external surface

and may be placed at small expense on any locomotive or stationary slide-valve engine.

This test, too, is unsatisfactory, because no exact figures are given to show the difference in fuel burned, or water evaporated, yet the difference was so great as to be apparent to every one. Taking the two together, under circumstances and with appliances so different, one at the East and the other at the West, it is tolerably clear that the actual loss and waste of power by using the slide-valve on steam engines is very nearly, if not quite, one-half or fifty per cent., according to the excellence or inferiority of the engine. That is, for every horse power developed and set free for the performance of duty or service, another half-horse power must first be created and wasted. This loss increases, too, in very great ratio with the increase of steam-pressure used.

This result, it is admitted, is very different from that anticipated by the writer when this investigation was begun, as it will doubtless be to most of those who read this paper. Yet it would seem to rest on a basis not easily controverted. Other new questions on this subject, which have come up in the course of examination, will be alluded to hereafter, with your permission.

OCCIDENT.

AN AMERICAN ENGINEER IN ENGLAND.

Peculiarities of English Passenger Rolling Stock.

LONDON, England, April 27, 1871.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It can hardly be claimed that the accommodation provided in ordinary express trains, on the English railways—for the express trains do not all carry the three classes—is at all in proportion to the prices charged for tickets. For third-class passengers a plain box car is provided; on some lines fitted in the inside with the plainest bare board seats, straight-backed, and without any arm rests or a division of the space into single sittings so as to prevent crowding. In many cases the window in the door on each side is the only means of light and ventilation, although in the newer carriages windows are placed on each side of the door. In a word, the average third-class carriage has put into its interior absolutely nothing that looks only to the comfort or convenience of the passenger, and only the very least that can be provided for his actual need, and this is simply a bare board seat. It is urged, with some show of reason no doubt, that any superior kind of fitting, such as cushions and the like, would be quickly cut to pieces and destroyed by the third-class ruffians, and so no good result would remain after a few weeks' use of the carriage; but there must be some better remedy for this than compelling people because they are poor to travel only in bare board boxes.

The second-class carriages are, as might be expected, a little better, but only a very little. On the seats are placed fixed cushions covered with leather or cloth, and against the ends of the compartments, which form the seat-backs, are fixed cushions covered with the same material, and generally thicker at their lower edge than at the top, so that the back of the seat is thus practically made a little slanting, thus affording a more comfortable position for the passenger. A curtain, held by rings which slide upon a horizontal bar above the door and windows, may be drawn if the sun shines too strongly, and these with a narrow, slightly-inclined shelf of some open work netting for small parcels form about the sum of the fixtures for the accommodation of the second-class passenger. It would not do, however, to omit to mention the slightly elastic cords which are fastened to the roof of the first and second-class compartments for the safe bestowal while traveling of the almost inevitable stove-pipe or chimney-pot silk hat, which must be worn when any one goes to London, whatever he may wear anywhere else. If a third-class passenger should be so unfortunate as to undertake to travel with one of these hats, he must take the best care he can of it, as the railway company gives him no peg to hang it upon, nor other means of disposing of it. Perhaps it should be remarked that to sit with one of these stiff-rimmed hats on in a carriage having these closed compartments, in which the partitions form the seat-backs, is to occupy a very uncomfortable position, since a person must sit upright the whole time, and hence every traveler over a long distance will be found to have his traveling cap with him, and it will make its appearance even before the train starts.

In the first-class carriages the cushions are softer, thicker, and are covered, generally, with a dark blue cloth, both on the seats and the backs, and the window curtains are generally of a more elegant material. In many of these first-class compartments the seats are di-

vided into halves, thus giving room for four persons on each seat, or eight in the compartment. More frequently, perhaps, especially with carriages that are likely to run on long journeys, the seats are divided so as to place three persons on each, and thus each person has an arm rest, and a side rest for the head also is formed by a partition projecting some seven or eight inches from the upper part of the cushioned back, and this partition itself is upholstered, so that, on the whole, if a person is able to sleep in an upright position, this accommodation is as good perhaps as could readily be devised. The strap by which the sliding window in the door is raised, or held when partly open, is generally covered in the first-class carriages with some ornamental material, or is woven throughout, and where it draws against the inside facing of the door a roller is commonly placed so as to make easier the raising of the window. A carpet or rug or mat of some suitable design is generally placed on the floor, and the inside of the roof is ceiled or closed in inside of the cross-beams with some plain cloth material. The usual shelf fixture for shawls, satchels, etc., is provided, but is rarely of any ornamental form.

Perhaps, to sum up the whole, the English carriages, in respect of their interior fitting, seem to me to be truly neat and substantial; but the first-class accommodation alone can be called at all comfortable, and that only within certain limits.

If I were to make a comparison between these English carriages and the American, I should, without any hesitation, express my most decided preference for the latter, whether considered in reference to the privacy afforded to each passenger, the general neatness and elegance of the fittings (and this, too, apart from any mis-called "silver-palace" appointments), and, above all, in reference to the convenience and comfort of the traveler, whether by day or night, and in winter or summer. Perhaps, to make this a little clearer, it might be said that any one, even in a crowded car, having only one person at his side, two behind him, and two with their backs toward him in front, would have a chance of greater privacy than could be had if from three to five persons were facing him upon a seat close in front and one sat close to him on each side, as would be the case if he hadn't secured a corner seat. It should be remembered that the length of these compartments, measured in the direction of the length of the train, is such that when the seats, which are placed across the carriage, are filled, a person at the side farthest from a station platform at which the train had stopped would have to push his way, sometimes very inconveniently, between the knees of the other passengers in making his way out of the carriage.

In the matter of light by day, the English carriages would be very greatly benefited by the adoption of the so-called "monitor top," so universally used in America, with its side windows and with the large increase of internal height—an increase greater, it is true, in appearance than in reality, but nevertheless of value.

It could not be urged as an objection to the use of this monitor top that the height of the carriages would be too much increased to admit of their safe passage through tunnels and under the permanent bridges over the lines, since a greater amount of space and light would be obtained, even though the height of the monitor top did not exceed that of the lamp cases or guards which are in universal use, projecting above the roof of the carriage, and which pass safely all the tunnels and bridges.

In reference to window blinds, and a neater, more capacious form of rack or pouch for shawls or parcels, little need be said, as it can hardly be denied that the later American practice leaves little to be desired. When the more important items are named, of lights by night—and, indeed, by day, in the numerous tunnels which are found on some lines—of the needful closets, and the means of warming the carriages in cold weather, the less there is said about them the better. On a very few lines gas is used, and the rest seem to be content with a system that it would be quite safe to say was devised forty years ago and which hasn't been changed since. As for closets, there are none and can be none, so long as the five or six-foot sections or compartments of the carriages are shut up each one to itself. Whether the traveling public will ever compel an entire change in this respect is what time alone can show, and it is sufficient to say that the present lack of these conveniences leads sometimes to results that are painful and annoying to the very last degree.

"How not to do it" would be a good name for the common plan of keeping passengers warm during the winter, which it is true is neither so long nor, on the whole, so cold as in many parts of the United States. Until quite recently even the foot-warmers, now supplied

only to first and second-class passengers, were unknown, and every one had to wrap himself up and keep warm as best he might, and as, indeed, to this day all third-class passengers must. The trade in railway rugs or knee-wrappers is something remarkable, and their use is absolutely essential, even with the hottest foot-warmer that can be procured, to secure comfort in traveling here, even when the thermometer may not be below 32°.

These foot-warmers vary somewhat in shape and size, but are about 18 inches or 20 inches long, 8 inches to 10 inches wide, and from 3 inches to 4½ inches high. They are strongly made of copper, galvanized iron or zinc, and have a screw plug at one end closing the small hole through which the hot water is poured in. Sometimes little wheels are placed on the under side, so that they can be easily pushed along the floor of the carriage, and a stout handle is fixed at one end by which to lift them from the truck on which they are brought from the boiler room, where they are filled, to the train. The heat of the water at starting is generally such that the hand cannot be borne against the outside, and at the end of a fifty mile run, on a day when the thermometer is not much below 25°, the surface of the warmer will be still less cold to the feet than the uncarpeted floor of a second-class compartment. At principal stations, however, less than fifty miles apart, the foot-warmers can generally be changed, and hot ones procured. This is, however, a mere make-shift, or a stepping-stone to a more comprehensive and better devised plan for securing comfort to travelers by railway, but why the adoption of expedients well approved by long use should be so long delayed is hard to see. It is true that a very large proportion of railway passengers travel here only for a few miles at a single journey, and yet it is by no means a desirable thing to travel even for half an hour only in a cold carriage.

In some of the carriages on lines where the stoppings are numerous and passengers wish to alight quickly, a light hand-rail is fixed to the roof, by which a person can steady himself when stepping past the knees and upon the toes of his fellow-passengers toward the door.

It is more difficult to step off from one of these carriages through the side door when the train is moving than to step from an American car, and, hence, there is some reason in the little notice placed upon a white porcelain label above the door-window on many carriages upon the London lines where stops are very short: "Wait until the train stops," and also in the similar and frequently heard cautions of the porters or guards on the station platforms. In many carriages, also, and in some station waiting-rooms are seen earnest appeals to passengers, posted by the railway authorities, to abstain from this dangerous practice, accompanied by warnings of the penalties prescribed by law—a fine of about \$10—against those who indulge in it.

On the inside of each door is generally painted the class of the compartment. First, etc., as the case may be and the same is painted on the outside of the compartment, on the door or on the side of the carriage. These precautions are taken not only that the passenger may know into what compartment to go, in the first place, but also that he may have no excuse for remaining in a carriage of a higher class than that to which his ticket entitles him, if he has entered it by mistake.

Sometimes the number of persons that are expected to find room on one of these seats is painted inside, on the end of the compartment, in the second and third-class carriages, "To seat five," or six, as the case may be.

The means provided for lighting the carriages seem to vary but very little on all the lines. The first thought in designing the usual form of lamp seems to have been to put the light entirely beyond the chance of interference on the part of any passenger, and the next to make the lamps most easily accessible to the station people, by whom they are placed or renewed, as may be required. Almost without exception, when oil lamps are used, they are placed in the center of the roof of each compartment, a round hole being cut in the roof and fitted with a sort of ornamental ring inside, and outside with a round box or tube 7 inches to 9 inches in diameter and 10 inches to 12 inches high, with a cap secured by a chain and admitting of ventilation for the lamp, but excluding the rain and wind. The lamp consists of a ring-shaped reservoir for the oil, large enough to fit snugly within the box and ring fixed upon the top of the carriage, and this oil reservoir has a handle on the upper side, for convenient lifting, and from the under side of it a brass tube projects downward in a sort of U form. At the lowest part of this bend the tube is flattened and enlarged, so as to receive a flat wick 1¼ inches wide,

which is held in place in this enlargement of the tube, and is fed with oil from the box above. This wick is designed to be so tightly held as to prevent any accidental overflow of the oil, if the cock that controls it just above is deranged or open too wide, but a leakage sometimes takes place nevertheless. To the under side of the ring shaped oil reservoir is fixed a nearly hemispherical glass globe, or guard, about 8 inches in diameter and 5 inches deep, sometimes flattened or fluted on the under side, which encloses the light and also catches any overflow of oil from the wick. It will be seen, then, that the lamps must be lighted for any train in the lamp-room in the station, and they are brought, 20 to 50 at a time, on a frame truck made for the purpose, along the platform to each carriage in turn. A porter gets upon the top of the train, and opening one of these boxes fixed upon the roof of the compartments, catches a lighted lamp tossed up to him from the porter at the lamp truck upon the platform, and puts it down inside of the box into the place made to receive it, and the light being thus within the glass globe which projects downward into the compartment, is secure against any interference from passengers. The porter replaces the cover held by the chain, and, going along on the tops of the carriages, sets all the lamps in the same way. The smoke from the light (and it generally does smoke) passes up through the center of the oil box and out at the top of the curb. These lamps can be put in or replaced quite rapidly, and give a light that is tolerably good, but in no way better than that afforded by the large candles, so much used on American lines, and which can be set, even on this English plan, by a much less expensive and cumbersome fixture. What would be the difference of cost, if any, in favor of the use of oil instead of candles, I cannot say, but in point of compactness and elegance of adaptation, the candle is certainly preferable.

When gas is used, as upon the Metropolitan Railway in London (the underground line), the glass globe or guard is permanently fixed, projecting inside the carriage roof, and so is the gas burner inside of it. A sort of reflector is fastened to the external cover of the box upon the roof, through which the light is accessible only from above; and this reflector, having a hole in the center through which the heated air or smoke can escape, hangs down quite close over the gas flame, so as to reflect from its white enameled surface as much of the light as possible into the compartment below. The gas is carried in a sort of flat tank on the top of the carriage, and this is filled through a flexible hose, attached as may be required at principal stations. The white reflectors are brushed off with a wet cloth several times a day at terminal stations to remove any soot that may have gathered.

The practice of locking the carriage doors, to which many, especially Americans, object, is by no means universal, and it is entirely abandoned on lines or trains where stops are frequent. As the rule here is to keep to the left on the double track, and as almost invariably there is a platform with station buildings, etc., for each track, all passengers enter and leave the train on the left hand, so that the doors on the right hand side will be kept locked while those on the left will be simply closed and latched. The keys by which the doors are fastened have a square shank, and the lock itself is sunk into the door so as to be reached only by this peculiar key; but still keys can be bought almost anywhere for a trifle, so that those who are really nervous about being locked in can carry the remedy always with them.

The latches by which the doors are held are upon the outside only, and, hence, even if the door be not locked, the window must be let down and the arm put out to turn the latch. If the door is locked, a porter must be called (and there are generally plenty of them) to unlock it.

Across the window in the door are very often placed one or two bars, sometimes inside, to prevent any heads from being put so far out as to run the risk of injury, but since some deaths have undoubtedly been caused by the impossibility of passengers escaping through these barred windows from an overturned carriage, they are not looked upon as entirely desirable.

RAIL SUPPLY FROM ENGLAND.

II.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Under this heading we tried, in your columns of last week, to throw some light on the mode of securing the best article for the money expended, by establishing direct dealings with the makers of rails in England. We now propose to enter more specially on the technical part of the manufacture, forming the basis for specifications of different kinds, as well as for the in-

spection of rails during and after their manufacture. In a commercial point of view, the specification should comprise the quantity, section, weight per yard, lengths, mode of manufacture, inspection, marking, punching, notching and delivery. Of these various conditions of contract we need only dilate upon some. As to section, we take from the London periodical *Engineering* of last year* Sandberg's standard section of 56 lbs. per yard, which we believe may be considered a fair specimen of what is really wanted, as well as of what can be easily executed. It is sufficiently known and discussed by this time, both among rail-makers and importers, not to require any more minute description here, and we, therefore, pass on to the mode of manufacture. As a rule, specification, in this respect, refers only to what is called "extra" rails, ordinary iron rails being made according to the methods adopted by the different makers themselves. A specification for extra iron rails at an additional price of, say, 10 shillings per ton above that of ordinary or common rails, should be framed as follows: The top slab to be not less than 2 inches in thickness, and made from a pile of puddled bars only, placed so as to cross the joints, heated twice and rolled to a slab; or it may be made by doubling up puddled balls to a bloom, which must be reheated to a welding heat and rolled to the dimensions stated. Fractures of the slabs must show perfect welding, with no blisters or layers, whether the slab has been made direct from puddled balls or from a pile of puddled bars next to the top slab, but the construction of it in other respects may be left to the manufacturers. The pile to be heated and turned in the furnace, bloomed between two rollers or under hammers, reheated to an even welding heat, and rolled to a rail of exact section and weight. In order to secure perfect welding between the top slab and the rail-head, as well as to prevent the flanges of the rail being burnt and brittle, the rail pile should be charged in the furnace with the top slab up.

Next, as to tests: For trying the strength of the rail it should be placed on supports of solid iron blocks, 4 feet apart, and a ball weighing half a ton let fall on the head of the rail in the center between such supports, from a height varying according to the stoutness or weight per yard of the rail to be tested, say 4 feet for a 40-lb., 5 feet for a 50-lb., 6 feet for a 60-lb. rail, and so on in proportion. One rail out of every 1,000 should be tested, and if not broken, the whole 1,000 accepted; but if it should break, 10 rails must be tested from equal lots of the same make, and for each one of these rails standing the test the remaining 99 should be accepted. For welding test, the rails should be broken from the flange and must show perfect welding in the head, and no seams or layers, neither between the slabs and the body of the rail, nor in the different parts of its wearing surface.

The inspector should be present at the works at all times during the rolling, to see that the rails are made to specification, to superintend the tests for strength and welding as mentioned above, in order to insure sufficient strength as well as durability of the rails, and to pass and stamp each rail approved of before leaving the works. The inspector should be appointed and paid by the railway authorities and furnish them with weekly reports of the progress of manufacture and the results of his examination.

The number of different specifications equals that of the various rail sections, as almost every railway engineer composes his own, more or less good. The great benefit which would be derived from an adoption of uniformity in these respects is self-evident, and we have, during the last year, observed considerable progress being made in that direction. As regards different specifications, we may say that such stipulations do not, by themselves, secure a good rail, and that an intelligent and careful inspection during the manufacture is, in point of fact, the best specification; and were it not for the great distance and the smallness of the orders generally, we think that every railroad company having rails made in England would do well to send over their own inspector. When this cannot conveniently be done, the next best course is to employ a professional engineer of reputation, stationed in the district where the manufacture is going on, who, from his constant experience, is able not only to watch its progress, but to supply the best reliable information.

The great difference between the two rail-making districts in England being well known, namely, that the Welsh rails are safe, but apt to laminate, whereas the Cleveland or North of England rails are more liable to break, we are, nevertheless, of the opinion that the one defect as well as the other could be in a great measure obviated by any one who is really desirous of procur-

ing a safe and durable iron rail, by adopting the expedients suggested above. On the other hand, what can possibly be expected of common rails, made anyhow, when not certified? Assuredly nothing beyond what is called a "merchantable article," which may indicate rails safe to run upon without breaking, but gives no reliance as to wear—a very thin top-slab offering little or no wearing surface; and if even this is not certified by some independent expert, the rails can scarcely be considered safe to run on without fear of breaking and causing accidents. There are, we freely admit, many lines on which the capital at disposal does not allow a superior description of rails to be laid down in the first instance, and others where the traffic is so inconsiderable that such rails are not necessary; but those who are in want of a really reliable article should not allow themselves to be blinded by the assertion that equally good wearing iron rails cannot be obtained now as at any former time.

The considerations which recent experience has given rise to regarding the manufacture and wear of steel rails, we will endeavor to set before your readers in a following article.

THE STRUCTURE OF STEEL AND FIBROUS IRON COMPARED.

LONDON, May 1, 1871.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In a recent number of your paper I saw a short item relating to the somewhat worn question of fibrous iron, as specially adapted to use in the base of an iron rail and contrasted with the harder but weaker crystalline iron sometimes used for its head. Without dwelling upon the question of what may be the cause of the weakness of this harder iron, I wish to say a little more about fibrous iron as contrasted with steel, of the usual good quality found in rails, since the impression, still strong in many minds, that steel is not the true thing after all, is continually coming to the public notice.

There can be little doubt that the prevailing impression about the comparative strength of fibrous iron has arisen more from the known superiority of fibrous wood, such as ash or good oak, than from any careful examination of the minute constitution of this metal as compared with steel.

That a piece of ash, which cannot be broken for very toughness, should be stronger than some kinds of inferior pine, or some dead and worthless hard-wood timber, is easy to understand and to prove; but it may not be equally easy to show or to prove, what is certainly the fact, that the piece of ash timber would be rendered very much stronger if by any means it could be made of exactly the same strength all through; that is, having no weak places between the fibres, or where the fibres lie against each other, but having all the spaces between the fibres as strong as the material or substance of each fibre itself, or, in other words, if the whole piece of timber were one entire solid fibre, instead of being a bundle of small fibres grown together.

Now this illustration is for my present purpose almost an exact one, and I think most persons will admit its truth; but as there may be some who still doubt, I would like to go a step farther. Suppose a pile were made up of pieces of wire rope, of a convenient length, and put into a heating furnace, brought to a welding heat and then hammered or rolled by the usual appliances of a forge. It must be plain that if these single wires, forming the wire rope of which the pile was made, were not perfectly welded by the hammer or rolls, the bar resulting from this heating and working would be weaker than if the welding had been absolutely perfect. It is also plain that if the welding of the wires had been really perfect, that is, if the iron of one wire had been hammered or rolled into absolute contact with the iron of the adjacent wires, then no fibrous structure of the finished bar could ever appear; for a fibre is simply a detached or isolated part of the mass which has not been absolutely welded or joined to the rest.

It is impracticable, however, for any iron worked in this way—by piling and hammering or rolling—to be absolutely free from intermixture with the silicious or mineral matter which causes the separation of the mass more or less into distinct portions or fibres, although it is, at the same time, perfectly true that, by careful selection and skillful working, admirable forgings or bars may be made from scrap material, which is too often spoken of as worthless, even for such plain and simple work as axles.

To return now to the material found in the rail: The puddler's ball, when worked in the usual way, is but a mass of grains or bits of iron stuck together by the fluid or semi-fluid cinder used in the puddling furnace; and although the bits or grains of iron may be, and are, elongated into fibres by hammering or rolling, yet this

*Copied in the RAILROAD GAZETTE of September 24, 1870.

cinder cannot be entirely worked out, and in fibrous iron there is enough always remaining to cause the separation of the material or substance of the puddled bar into fibres, and hence to be an inevitable source of weakness.

When the material used for the rail has been thoroughly melted, however, as it may be in two or three ways, although not in the puddling furnace, then the whole state of the case is changed, and the particles of the metal come in this melting close to each other by virtue of their own cohesive attraction, and the bar resulting from the hammering of the ingot or mass into which the fluid metal is cast will be found to be of a perfectly uniform consistency throughout, so far as the arrangement of its particles is concerned, and without any such admixture of cinder dividing it into bits or fibres and thus rendering it weak. The iron which is worked in the puddling furnace in the usual way cannot be melted at the comparatively low heat of this furnace after it has "come to nature," or has become very nearly or quite decarbonized, and hence this iron must be worked up from a plastic state, while full of weakening mineral impurities; but the metal produced from the crucible or steel-melting furnace at a much higher heat contains a sufficient although a very small quantity of carbon to render it fusible at manageable heats, and hence it can be cast from a fluid state into any form required for subsequent manufacture.

Experience has abundantly shown, as indeed experience only could show, that steel is the strongest form of the metal which in its more common forms is known as iron, and also that it is thus the strongest form because of the very fact of its crystalline nature, or, in other words, because it has been fully melted, and its particles have thus been allowed to arrange themselves in becoming solid or in congealing according to their own laws, which, however obscure, are known to be unfulfilling in their action and results.

It should not be supposed that the steel is absolutely free from any intermixture of mineral material, for this is found in all steel, and when in excess is a very dangerous source of weakness; but it is enough for the present purpose to say that, so far as can be known, the arrangement in the ingot or bar of steel of the particles of mineral matter and the particles of steel themselves is different from the arrangement of the similar particles in the bar of fibrous iron, and that the steel is not weakened in the same way or to the same extent as the bar of iron.

If an example were needed of an important use of this crystalline metal simply because it is the strongest that can be had, mention might be made of four round posts 11½ inches in diameter, with solid steel nuts, for an hydraulic press capable of exerting a pressure of six thousand tons, recently made for an English manufacturer, and for a use in which two posts nine inches in diameter had been pulled asunder, although made of this same material.

It is not necessary in this connection to enter into any discussion of the serious effect produced by all the various impurities that are likely to be found in steel, because in any discussion of the strength of materials the best of its kind that can be had in current practice must be taken as the standard, and from this standard deductions must be made for all imperfections that may be known or suspected to exist.

FAIR PLAY FOR STEEL.

FRICITION UTILIZED.

There is no obstacle so formidable to the economical use of power as the resistance of friction. It is the giant that has hitherto back from apparent success, implying wealth and great fame, the patient and persevering perpetual motion-seeker, and in all mechanical devices a tribute of power lost must be paid for which no equivalent is returned. But, like many other enemies of progress, friction is frequently turned to a good account and made to render a useful effect, so as to balance, in no small degree, the losses sustained through its effects in other ways. Friction diminishes, to a great extent, the amount of work derived from steam, but, taking away the resistance which it offers, the locomotive would stand powerless upon the track and expend the full working power of its energies in simply turning the drivers, without securing forward motion.

The general laws of friction have been deduced by experiment, and may at first appear a little unreasonable, but, as they are practical results, and not the mere conclusions of theory, they must, of course, be accepted. To quote them directly from Hamilton's "Useful Information to Railroad Men," they are:

"1. When no unguent is interposed, the friction of any two surfaces (whether of quiescence or motion) is directly proportional to the force with which they are pressed

perpendicularly together; that for any two given surfaces of contact there is a constant ratio of the friction to the perpendicular pressure of the one surface upon the other. While this ratio is the same for the same surfaces of contact, it is different for different surfaces of contact. The particular ratio of it, in respect to any two given surfaces of contact, is called the co-efficient of friction in respect to those surfaces.

"2. When no unguent is interposed the amount of friction is in every case wholly independent of the extent of the surfaces in contact, so that the force with which two surfaces are pressed together being the same, their friction is the same, whatever be their surfaces of contact.

"3. That friction of motion is wholly independent of the velocity of motion.

"4. That when an unguent is interposed the co-efficient of friction depends upon the motion of the unguent and upon the greater or less abundance of the supply."

Such are the general laws as deduced from experiments made by Morin, a French physicist.

We will consider only the law as applied to surfaces without the interposition of any lubricating substance, and show the relations existing between the friction of plane flat surfaces, when the pressure is normal to the surface, and the case when the pressure is at an angle to the surfaces in contact.

Taking the case of a wedge moving in a groove or slit whose sides make the same angle with the vertical as the side of the wedge.

According to the law given above the resistance that the wedge would offer to horizontal motion is directly proportional to the normal pressure upon the surfaces in contact. We must, therefore, determine the relation existing between the vertical pressure (P in Figs. 1 & 2) acting in the direction of the center line of the wedge, and the pressure that it will cause in the direction of a perpendicular to the surfaces in contact, which is its normal component ($n p$ in Figs. 1 and 2.) Quoting directly the formula for the action of a wedge, as derived from mechanics, resulting from a simple resolution of forces, $n p = \frac{P}{\sin 2\alpha}$, we see that the normal pressure always equals the vertical pressure divided by the sine of half the angle of the wedge, or, better, by the sine of the angle which the side of the wedge makes with the line of direct pressure.

To show how this law affects the pressure at various angles, we give the following table for angles varying from 180° or a plane surface, taken as unity, to the minimum angle of 1°, the co-efficient given being the reciprocal of the natural sine of half the angle corresponding:

180°=1.000	70°=1.743	10°=11.467
170°=1.004	60°=2.000	9°=12.788
160°=1.015	50°=2.304	8°=14.396
150°=1.035	40°=2.747	7°=16.366
140°=1.063	30°=3.464	6°=19.190
130°=1.108	20°=4.547	5°=22.935
120°=1.185	10°=7.663	4°=28.653
110°=1.301	14°=8.196	3°=36.197
100°=1.555	12°=8.545	2°=57.143
90°=1.414	11°=9.583	1°=114.577
80°=1.555	10°=10.438	0°=infinity.

Multiplying a co-efficient from the above table by the co-efficient of friction for any given surfaces of contact, will give the resistance offered by friction to motion along the surface at the corresponding angle for each unit of pressure applied in the direction of the center line of the wedge.

To apply these results to a practical case, as a conical friction clutch, or wedge-shaped traction rail, such as proposed by Hornig for canal-boat propulsion (Fig. 2), we have but to determine the direct pressure on the line bisecting the angle of the cone or rail. This, multiplied by the co-efficient from the table corresponding to the full angle, gives the actual pressure in the direction of the perpendicular to the surfaces of contact.

Multiplying this result by the proper co-efficient of friction for the material employed, gives the resistance that must be overcome in order to slide one of the surfaces over the other, or the actual holding power of the device. In the case of the clutch, we must, of course, take into consideration the leverage or purchase afforded by the combination of the windlass and clutch-lever.

The angle, when the resistance offered by friction will just equal the weight or pressure applied, will be

the angle, the sine of whose half just equals the co-efficient of friction for the materials used. This angle will also be the maximum angle at which the wedge or cone will stick after the pressure is removed. It will, perhaps, be well to remark, in conclusion, that the laws of friction, as given above, apply only within moderate limits, and thus for very high pressures the co-efficient of friction varies considerably from that commonly given.

CHARLES P. GILBERT.

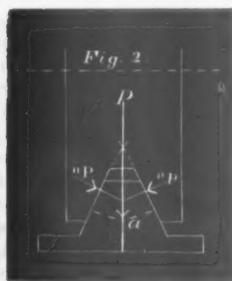
CHICAGO, May 16, 1871.

Report of the Grand Trunk Railway of Canada.

The report states that the gross receipts upon the whole undertaking for the half-year ending December 31, 1870, including the Buffalo and Champlain lines, have been £793,740; deduct the ordinary working expenses (being at the rate of 67.12 per cent., against 61.25 of the corresponding half of last year £532,762; the renewals, etc., of the permanent way and works in the half-year debited to revenue, £136,101; total £668,863; and there is left an available balance earned in the half-year of £124,877; deduct loss on American currency, £8,284; and the balance remaining is £116,593. To this sum of £116,593 has to be added the balance carried from the net revenue account of last half-year of £8,639; making a total balance of £125,232. From this, however, has to be deducted the amount of postal and military revenue due for the half-year to the postal bondholders of £16,981; leaving the balance of £108,251 applicable for the following payments, viz.: Interest, etc., paid on lands, £1,602; do. on mortgage to Bank of Upper Canada, £4,423; do. on loans, bankers' balances, promissory notes, European exchange, etc., £563; do. on British-American Land Company's debentures, £616; do. on Montreal Seminary debentures, £616; do. on Island Pond debentures, £2,700; half-yearly installment on Portland sinking fund, £1,211; Atlantic & St. Lawrence lease (in full), £28,399; Detroit line lease (in full), £11,250; Montreal & Champlain Railway Company, £7,572; Buffalo & Lake Huron, £25,000; first equipment bond interest, £15,000; second do., £8,115; balance carried forward, £1,118. Comparing this half-year with the corresponding period of 1869, the gross receipts show an increase of only £2,546, although there were carried 34,912 more passengers and 79,492 more tons of freight. It was almost entirely in consequence of the lowness of the rates that, while the passenger traffic increased in numbers 5 per cent., and the freight traffic in quantity 18 per cent., the increase in the money received during the half-year was only one-third per cent. The average receipt per passenger was for this reason 5s. 11d. against 6s. 3d., and per ton of goods 14s. against 15s. 7d.; and it will be seen from the following table that the fares and rates were lower than they had ever been since 1862, when the line was fully opened for through traffic:

	s. d.	s. d.
1870, June	The receipt per ton was 14 6	And per passenger 6 5
" Dec.	" 14 0	" 5 11
1869, June	" 16 0	" 6 9
" Dec.	" 15 7	" 6 3
1868, June	" 16 1	" 6 8
" Dec.	" 16 3	" 6 9
1867, June	" 15 1	" 6 8
" Dec.	" 15 4	" 6 10
1866, June	" 15 4	" 7 0
" Dec.	" 15 5	" 7 2
1865, June	" 16 11	" 6 3
" Dec.	" 15 5	" 7 2
1864, June	" 16 3	" 6 0
" Dec.	" 16 1	" 6 6
1863, June	" 17 8	" 6 0
" Dec.	" 15 1	" 6 5
1862, June	" 15 9	" 6 10
" Dec.	" 17 7	" 5 7

As a further illustration of these reductions in the rates, it may be mentioned that, taking flour as a standard for the freight, the rates from Chicago to Portland were in 1870 \$1.10 per barrel, in 1869 \$1.40 per barrel, and in 1868 \$1.70 per barrel; and, as regards passengers, the rates were 25 per cent. lower in 1870 than they were in 1869. To this cause is to be mainly attributed not only the small increase in the gross receipts, but also the heavier percentage for working expenses. The ordinary expenses for the half-year amounted to £523,762, or 67.12 of the receipts, being £48,191, or 5.87 per cent., in excess of the expenses for the corresponding six months of 1869. A reference to the reports and tabular statements appended to the report will show that the train mileage for the last half-year was 3,193,200, as against 2,963,101 for the corresponding six months of 1869, or an increase of 230,389 miles. The mileage of cars in the same period was 40,687,258, as against 37,060,788, or an increase of 3,616,470 miles. The renewal expenditure also for the half-year was unusually heavy, having amounted to £136,100, against £73,745, charged in the December half of 1869; but it will be remembered that for the latter half-year £36,343 was charged to capital for the improvements of permanent way, extra weight of rails, etc. In the present half-year's accounts no such items are charged to capital. In accordance with the promise made by the directors in their report of April last these items have all been brought into the revenue accounts. They then stated "that all outlay in substitution or renewal of the permanent way and its accessories, and of bridges and works of art, however much they may improve or give increased solidity and value to the railway, the directors purpose, henceforth, to charge to revenue." The laying of steel rails, under these circumstances, with a view to future economy, will increase, in the meantime, the charge for renewals, as the extra cost of steel rails, as compared with new English iron rails, is about £4 per ton, and, as compared with Toron or re-rolled rails, £3 10s. per ton. In three or four years, however, from the present time, the company will be receiving the benefit of this extra outlay for putting down steel in place of iron rails. The total number of miles relaid during the past half-year was 108½, of which 53½ were laid with steel. 490,697 new ties were



put into the track, and 125 miles of the line were ballasted. The steel rails which were laid in the track during the past season have given great satisfaction. They were exposed to the severity of the coldest winter which has been experienced in Canada during the past twenty years, and, with the three exceptions in first laying mentioned in the Engineer's report, not a single steel rail has broken or shown any sign of fracture or wear. The loss upon the conversion of American currency compares very favorably with that shown in the accounts for the December half-year of 1869—the saving amounting to nearly £25,000. The charges to capital for the half-year are fully set forth in the accounts. Out of the total of £508,134, £410,098 is for the capitalized interest on the preference bonds and stocks for the year 1870, and the remainder is for new works, ballasting, land claims, etc. The capital required for the International Bridge at Buffalo has now been provided, and the bridge will, it is hoped, be opened for traffic in the course of next year. The low fares and rates referred to in section 13 of the report for the half-year ending June, 1870, continued for five out of the remaining six months of the year; and, while the permanent way and the rolling stock were being carefully prepared for a better condition of affairs, the heavy work which was performed was not, in the meantime, attended with proportionate profit. It will be obvious to the proprietors that while, on the one hand, low rates have *pro tanto* the double effect, for a given amount of work, of reducing the gross receipts, and of raising the percentage of working expenses; so, on the other hand, improved rates must have the opposite tendency of simultaneously reducing the percentage of working expenses and also increasing the gross receipts. The relative proportions of working expenses and of net profit depend, therefore, upon the rates. Whether the rates be high or low, the same cost is incurred in the transport of the same quantities of passengers and produce. A rise of 20 per cent. in the rates means, therefore, a very much greater proportionate increase of net profit. A half-year so exceptional as that under review, during which rates have been literally at the lowest point since the line was first opened in 1862 for through traffic, cannot be taken to be a guide for the future. Since last December, when a partial cessation of competition for Western traffic between the railways of the United States took place, a great improvement has been manifested. A continuance even of the existing fares and rates will bring about an important change. The working of the current half-year has already resulted in an increase (including one extra day's traffic) of £58,000, or an average for the twelve weeks, since the 1st of January, of about £5,000 per week. The company is free from debt, and in the possession of means for all necessary purposes. The completion of the International Bridge over the Niagara River is secured. The Intercolonial Railway is being rapidly constructed, and other enterprises of importance are projected in the Dominion which cannot fail to give an increased stimulus to the trade and commerce of the country. At the rates which ruled in 1869, the traffic which was carried last half-year would have yielded an increase of £16,173 in the passenger traffic, and £54,500 in the freight traffic, which two sums, amounting together to £70,647, would have been more than sufficient to pay interest in full for the half-year on the first preference bonds. Since the commencement of the current year the rates though not yet equal to those of 1869, have resulted in the increase of £58,000 for the past twelve weeks, and the directors feel, therefore, that they may look forward with some confidence to the results of the present year's traffic.

ELECTIONS AND APPOINTMENTS.

—John Thomas, late Assistant Superintendent of the Cleveland & Pittsburgh Railroad, has been appointed General Superintendent of the same road, in place of William Stewart, who has accepted an appointment as General Freight Agent of the Pennsylvania Company.

—Mr. James K. Taylor, for six years and until lately Master Mechanic of the Eastern Division of the Lake Shore & Michigan Southern Railway, with office at Adrian, Mich., has accepted an appointment as Master Mechanic of the Old Colony & Newport Railroad, with office at South Boston, Mass., and entered upon his duties April 15.

—The following gentlemen were elected Directors of the Delaware & Raritan Canal Company on the 10th inst.: Robert F. Stockton, John S. Conover, William W. Shippen, Albert W. Markley, John Jacob Astor, and G. Morris Dorrance.

—The annual election for directors and officers of the Wiggins' Ferry Company, took place on the 9th inst., in East St. Louis. The following gentlemen were elected as directors: Hon. Joseph Brown, F. L. Ridgley, Jr., Samuel C. Clubb, N. Mulliken and J. J. Scanlon. The new board organized by electing Mr. James J. Scanlon President, and Mr. N. Mulliken Vice President; Mr. H. L. Clark was appointed Secretary and Treasurer, and Mr. S. C. Clubb General Superintendent. Col. Louis V. Bogy, for upwards of twenty years President of the company, was a candidate again, but was defeated by a small majority.

—At the monthly meeting of the directors of the Baltimore & Ohio Railroad Company on the 10th inst., the office of Second Vice-President of the company was created, and Mr. William Keyser was chosen to fill the office. The office and the appointment were made at the request of President Garrett, who said: "In addition to other palpable causes, the recent completion of the highly important Pittsburgh, Washington & Baltimore road and the pressure for rapid movements to insure the early construction of the Baltimore, Pittsburgh & Chicago road, the great line from Pittsburgh through Ohio, Indiana & Illinois to Chicago, imperatively require the appointment of an additional Vice-President. Under these circumstances the Presi-

dent was gratified to be able to state that Mr. William Keyser had assented to accept such a position. Although Mr. Keyser was quite a young man, being but thirty-five years of age, he had already achieved a reputation for superior business qualifications, for diligence, for integrity and appreciation of the interests of the public which made it needless for the chair to express its judgment as to the value of the services which he would be able to render to the company and the community in the proposed position."

—The following directors of the St. Louis, Council Bluffs & Omaha Railroad Company were elected at St. Louis recently: Gen. J. H. Hammond, Chillicothe; J. F. Wilson, Fairfield, Iowa; C. G. Comstock, Albany, Mo.; Wm. T. Glidden, Boston, Mass.; J. Pierpont Morgan, New York; G. M. Dodge, Council Bluffs; John Jackson, James B. Eads, John G. Copelin, John R. Lionberger, Julius S. Walsh, Wm. Taussig and Thomas E. Tutt, St. Louis. All these are former directors except Messrs. Walsh and Tutt who fill vacancies caused by the retirement of E. Creighton, of Omaha, and Peter Bear, of Davies County, Missouri.

—Mr. A. N. Towne, General Superintendent of the Central Pacific Railroad, was, on the first of May, appointed General Superintendent of the Southern Pacific Railroad, now completed from San Francisco to Gilroy.

—The stockholders of the Memphis & Raleigh Springs Railroad Company, met on the 13th and elected the following board of directors: J. T. Swayne, M. D. L. Stewart, A. J. White, A. B. Newkirk, G. K. Duncan, W. A. Bickford, E. W. Brooks, M. E. Cochran and O. F. Prescott. Judge J. T. Swayne was elected President.

—A meeting of stockholders of the Omaha & Northwestern Railroad Company was held at the company's office, in Omaha on the 9th inst. Hon. Ezra Millard and J. A. Morrow, Esq., resigned their offices as directors, and James E. Boyd, Esq., resigned the office of President, and Jonas Geise, Esq., that of Vice-President. Messrs. Augustus Kountze and C. A. Downs were elected directors. The vacancies being thus filled, the new board of directors for the ensuing year is as follows, viz: J. E. Boyd, J. Geise, E. Creighton, John I. Redick, G. M. Mills, J. A. Horbach, Herman Kountze, Augustus Kountze and C. A. Downs. Hon. Augustus Kountze was then elected President, and J. A. Horbach, Esq., Vice-President of the company.

—The following directors of the New York & Harlem Railroad were elected on the 16th inst.: C. Vanderbilt, W. H. Vanderbilt, W. C. Wetmore, Abraham B. Baylis, Horace F. Clark, Augustus Schell, Jas. H. Banker, C. M. Messerole, John B. Dutcher, Wm. A. Kissam, Robert J. Niven, Joseph Harker, C. Vanderbilt, Jr. These were all members of the previous board except C. M. Messerole and Robert J. Niven, who take the places of Oliver Charleek and John M. Tobin.

—Mr. E. A. Ford has been appointed General Passenger and Ticket Agent of the Missouri Pacific and Atlantic & Pacific railroads. To accept this appointment, Mr. Ford resigned his position as General Passenger Agent of the Cleveland, Columbus, Cincinnati & Indianapolis Railroad.

—The following is the Board of Directors of the new Burlington & Northwestern Railroad Company: John H. Gear, James Morton, T. W. Barhydt, Charles Beardsley, H. H. Scott, Jno. S. David, Robert Donahue, J. P. Sunderland and Thomas Hedge.

—R. M. Teller, of Central City, Colorado, was elected President of the Colorado Central Railroad on the 12th inst., succeeding T. J. Carter.

—G. W. Mitchell was elected President of the Iowa & Pacific Railroad Company at a meeting in Dubuque on the 16th inst.

—On the 14th inst. the Camden & Amboy Railroad Company re-elected the following directors: William H. Gatzmer, Philadelphia; Benjamin Fish, Trenton, N. J.; Ashbel Welch, Lambertville, N. J.; Cambridge Livingston, New York; Samuel Welch, Philadelphia; Charles McAllister and William G. Cook.

—At a meeting of the Board of Directors of the Rockford, Rock Island & St. Louis Railroad Company, held at New York on Tuesday last, May 9th, Jas. R. Young, H. H. Boody, D. A. Boody, O. D. Ashley and David Turnbull resigned their offices and seats at the board. The following gentlemen were elected to fill the vacancies, with an addition of two members to the number of directors: R. R. Cable, of Rock Island, Director and President; C. Lynde, Jr., of Rock Island, Director and Treasurer; Mylo Lee, J. M. Buford, of Rock Island; Hiram Cable, G. W. Cable, of Davenport, and B. Stickney, Sr., of St. Louis, Directors. The new board consists of the above-named gentlemen, and the following who were members of the old board: Henry Budge, Leo Lehmann, New York; Calvin Truesdale, Rock Island, and John Moses, Winchester. No changes were made in the other officers of the company.

—The following gentlemen were elected directors of the Missouri, Kansas & Texas Railway Company, at a meeting held at Parsons, Kan., on the 17th inst.: Levi Parsons, George Denison, D. Crawford, Jr., H. A. Johnson, Francis Skiddy, J. P. Morgan, Sheppard Gandy, August Belmont, L. P. Martin and J. B. Dickinson, of New York; R. S. Stevens, A. D. Jaynes and J. R. Barrett, of Sedalia, Mo. Stock to the amount of 62,529 shares was represented. The only change in the new board are the election of J. P. Morgan in place of Joseph Seligman, and the addition of A. D. Jaynes and J. R. Barrett, of Sedalia, who, we believe, were taken in with the Tebo & Neosho road.

—At the semi-annual meeting of the Grand Trunk Railway of Canada, in London, on the 20th ult., Lord Wolverton, Mr. Thomas Baring, of London; Robert Gillespie, of Bolney, and Mr. Charles John Brydges, of Montreal, whose terms as directors then expired, were all re-elected.

PERSONAL.

—Mr. Julius Hornig, who has for some time been agent in Chicago of the Union Car Spring Company, has been appointed Engineer of the company and will, in a few weeks, make his residence in New York City.

—The Cleveland Herald has said of Mr. E. A. Ford, just appointed General Passenger and Ticket Agent of the Pacific of Missouri and the Atlantic & Pacific Railroads: "Mr. E. A. Ford commenced his railroad experience with the Cleveland, Columbus & Cincinnati Railroad, as Ticket Agent, in 1863. In 1864 he was promoted to General Western Agent of the same company, and soon after made General Passenger Agent of Bellefontaine Railway, and remained in that position until May, 1868, when he was made General Passenger Agent of the consolidated line of the Cleveland, Columbus, Cincinnati & Indianapolis Railroad, called for short the 'Bee Line.'"

—Mr. E. S. Bowen, the new General Superintendent of the Kansas Pacific Railway, was, in 1857, the manager of a steam saw-mill at Fort Scott, Kansas. In the autumn of 1858 he returned to Pennsylvania and accepted a position as engineer on the Philadelphia & Erie Railroad. He was afterwards appointed Superintendent of the Canandaigua Division of the Northern Central Railway, and remained connected with that company up to the time of his resignation to accept the new appointment.

TRAFFIC AND EARNINGS.

—The traffic receipts of the Grand Trunk of Canada for the week ending April 8 amounted to £32,200, against £33,100 in the corresponding week of last year, showing a decrease of £900.

—The traffic receipts of the Great Western of Canada for the week ending April 7 amounted to £19,516, against £16,787 in the corresponding week of last year, showing an increase of £2,729, or 16½ per cent.

—The traffic receipts of the Grand Trunk of Canada, for the week ending April 22, amounted to £30,800, against £29,100 in the corresponding week of last year, showing an increase of £1,700, or nearly 6 per cent.

—Since the completion of the Connellsville road the fare from Pittsburgh to Washington has been reduced to \$9.

MECHANICS AND ENGINEERING.

Express Engines.

The most powerful express engines in existence are those recently constructed for the Great Northern Line. The diameter of the cylinder is 18 inches, and a stroke of 28 inches, the steam pressures in boiler being 140 lbs. to the square inch. The diameter of the driving-wheels is 8 feet 1 inch, and the tractive force which the engine is capable of exerting is 180 lbs. for each pound of effective pressure per square inch on the pistons. The cylinders are outside, and are held in openings in the frame between the two foremost wheels. The leading end of the engine is carried on a four-wheel bogie; the weight on the driving-wheels is 15 tons, and the total weight of the locomotive in working order is 38 tons 9 cwt., while the tender has a weight of 26 tons 10 cwt. The boiler contains 217 tubes, of an outside diameter of 1 9-16 inches, the total heating surface being 1,165 square feet. Apropos of the "speed" question, I find the following: "The express traffic of the Great Northern Line necessitates the running of trains consisting of from 15 to 26 carriages from King's Cross to Peterborough at a mean speed of 47 miles per hour."—*Correspondence English Mechanic.*

Lake Steamer of Novel Plan.

The Chicago Tribune describes as follows a new propeller, "The City of Traverse," which Hannah, Lay & Co., lumber merchants of Chicago, have built to run between Chicago and Grand Traverse Bay, in the northwestern part of the lower peninsula of Michigan: "The boat, which is 213½ feet long, with an actual capacity of about 1,300 tons, and fitted with 63 berths, is really worthy of notice as a successful attempt to build a vessel for the lake trade that shall correspond, as nearly as may be, to the fire-proof buildings which have recently become so popular in this city. She is of extra strength throughout. Her boilers are placed on deck, which will enable the engineer to keep up steam even if the boat should be partly filled with water, whereas almost all other vessels are liable to be left helpless immediately on springing a leak, their boilers being below the water-line. These boilers are in water-tight compartments, and cased all around with iron, which is filled with material something on the principle of a fire-proof safe; while the most efficient arrangements, both of hose and buckets, are always in working order, if the first-named precautions should fail to prevent fire. All the connections of wood with iron throughout the boat are protected from rust and rot. The floors are filled with anti-rot preparation, and, in fact, everything seems to have been done that could possibly be done to prevent danger of destruction, either by collision or fire. A large extra cost has been entailed by the adoption of these precautions, but the owners believe that the outlay will be justified in diminished insurance rates and greater durability."

Cattle Guard.

A young farmer, Mr. Erasmus C. Helm, of Cedar Township, Iowa, has invented a substitute for a cattle guard which consists of a gate that is lowered by a train approaching from either direction, and which restores itself to an erect position after the train has passed.

Chicago & Illinois Southern.

Grading is progressing on the section of this road from Mattson northwestward to Sullivan, on the way to Decatur, and track-laying will be commenced in a few days.



PUBLISHED EVERY SATURDAY.

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Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the RAILROAD GAZETTE, if not previously published, FREE OF CHARGE. They are invited to send us drawings or models and specifications. When engravings are necessary the inventor is expected to furnish his own engravings or to pay for them.

Engineering and Mechanics.—Communications and correspondence relating to these subjects should be directed to M. N. Forney, No. 73 Broadway, New York. Subscriptions and advertisements will be received at the New York office, and any other business transacted with those to whom that office is most convenient.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Our Prospectus and Business Notices will be found on the last page.

THE GRAND TRUNK.

The story told by the report for the last half-year of 1870 is very like the old story—light receipts per mile, and these mostly required to pay operating expenses and a few rentals and preferences. The 1,377 miles of line operated by the company earned in the six months £793,740, or about £577 per mile, which is about at the rate of \$6,350 per mile in United States currency. This shows light receipts, yet not lighter than many a dividend-paying American railroad has. In the case of the Grand Trunk the receipts are small in proportion to the capital, rather than small absolutely. There is encouragement, however, in the last report, not, perhaps, in the increase of earnings over the corresponding half-year of 1869, which is but £2,546, but in the increase in business, which amounted to 5 per cent. in passengers carried and 13 per cent. in tons of freight. The rates were lower, says the report, than they had ever been since 1862, when the road was fully opened for traffic. But while this increase of business brought no appreciable increase of receipts, it caused a considerable increase in working expenses, which were 67½ per cent. in 1870, and 61¼ per cent. in 1869.

The better rates of the current half-year have had a good effect on the receipts, which for the first twelve weeks were greater by £58,000 than for the corresponding period in 1870, and the directors express their belief that the rates of 1870 will remain exceptional, and that the increased receipts will continue. It is quite probable that we may not soon have rates so low as they were last summer; yet it should be remembered that the general tendency in transportation changes, especially from the West to the East, is downwards, as the increasing business of the direct lines enables them year after year to carry at cheaper rates. The reports so far show that even with the unusually low rates of last year, the chief lines, such as the Pittsburgh, Fort

Wayne & Chicago and the Lake Shore & Michigan Southern (probably the Michigan Central also, though its operating expenses are not yet reported) made ample profits. They are doubtless all willing to make more, but rates are not likely to remain long much higher than the figures which have proved quite profitable. The Grand Trunk, like other American roads, must look for prosperity not to higher prices but to a larger business.

It seems strange that it should be thought advisable as a matter of economy to renew with steel rails a line with no heavier traffic than that of the Grand Trunk; but though this road has not often severe wear, in the climate of Canada its iron rails seem remarkably subject to breakage, so that the cost of maintenance is greater than on many busier lines.

A statement of the net earnings for each half-year for ten years past is quite interesting. For the last half of the several years since the road was opened through (in 1863), they have varied from £89,283 in 1864 to £199,978 in 1869, and the yearly net earnings have varied from £218,221 in 1867 to £364,099 in 1866. The net earnings for 1870 were £254,300, which is greater than the amounts in 1863, 1865 and 1867, and less than for any other year since the road was completed. Including the year 1862, when the company was operating about 350 miles less of line than since, but when the profits were unusually large, the average net earnings of the road have been £275,208, and the 1870 earnings were a little more than 9 per cent. below that amount. The profits cannot be said to have improved since the line was completed, as those for the first year thereafter have been exceeded but twice—in 1866 and 1869.

There has been an increase, though not rapid, in gross earnings, as will appear from the following tabular statement:

1862.....£232,353	1865.....£1,339,056	1868.....£1,402,960
1863.....966,802	1866.....1,356,706	1869.....1,465,814
1864.....1,146,539	1867.....1,313,500	1870.....1,496,307

In 1862 there were but 1,000 miles in operation; in 1863 but 1,174, and in 1864 but 1,335, against 1,377 miles since. A steady increase is shown, except in 1867, when the receipts were less than in 1865 or 1866.

With regard to the use by the Great Western of the 43 miles between Canfield and Fort Erie, owned by the Grand Trunk, the chairman of the latter company said at the stockholders' meeting, that there was "every prospect" that the two companies would come to a satisfactory arrangement concerning it. This is much to be desired, for the Canada Southern has announced its determination to construct a parallel line within two or three miles, and if the Great Western should construct another there would be a clear waste of just about the sum expended in eighty-six miles of road, for we imagine that the old road with its single track will be able to carry all the traffic for some time to come, begging the pardon of Lord Mayor Dakin, who told the Great Western shareholders that a double track would be needed when their Air Line should be completed.

Mr. Potter made one proposition which will probably provoke some discussion in Canada. It is that the Dominion should supply the capital necessary to reduce the gauge of the Grand Trunk from 5 ft. 6 in. to 4 ft. 8½ in., and then construct the Intercolonial and the Canada Pacific with that gauge. These latter must be of the same gauge with the Grand Trunk, but Mr. Potter argues that the Canada Pacific will naturally have numerous connections with the railroads of the United States. He was supported by Captain Tyler, the Government Inspector of Railways, who said:

"It has always appeared to me—and this is a question to which I have given great attention with reference to railways both in this country and in other countries—it has always appeared to me that, considering the amount of traffic that was likely to be obtained on the Intercolonial Railway the idea of employing the 5 feet 6 inch gauge for the whole length of that line, and through such country, was little short of madness. It was, perhaps, not for us to remonstrate against that state of things, because it was rather to our advantage than otherwise that the gauge should be 5 feet 6 inches. Whatever traffic goes over the Intercolonial must come to us, and whatever traffic we send in that direction must go over our line. In order to avoid the disadvantage of break of gauge, so long as our gauge was 5 feet 6 inches it was to our advantage that the gauge of the Intercolonial should be 5 feet 6 inches also. But it was for the Government of Canada to consider whether it was desirable for them to incur the extra expense which was necessary to make the gauge 5 feet 6 inches on that line; and now that they have made an actual contract with British Columbia, on the Pacific coast, 3,000 miles beyond us, to construct a line of a character and dimensions which one looks at almost with awe and amazement, the very idea of continuing the 5 feet 6 inch gauge over the whole of that route is really something that is difficult to believe in. Under those circumstances, it must be exceedingly desirable, in the interests of every man in Canada, that the gauge of the Grand Trunk should be altered, and the gauge of the Intercolonial should be

reduced, and that, as my friend the President has observed, there should be but one gauge, and a narrower gauge, from the Atlantic to the Pacific."

As we have said before, the Grand Trunk must look for prosperity, not to permanent increase of rates, but to an increase of traffic. With the extraordinary low rates of 1870, the Pennsylvania Railroad Company earned from the western half of its New York & Chicago line enough to make a profit of a million dollars after paying a rental of 13 per cent. on the stock of that section. The other roads made large profits the same year (during one-half of which the rates were very low) and the general tendency is toward a reduction—not rapid or sudden, probably, but, for a series of years, certain. The growth of Canada, the opening of new lines tributary to the Grand Trunk, the increase of trade with the growing Northwest, tend constantly to increase its business; the construction of new lines from Portland westward and the opening of new routes to the sea coast—such as that which the Baltimore & Ohio proposes to make—tend to decrease it. The traffic, however, is likely to increase faster than the routes, and this is in favor of the Grand Trunk.

THE POWER REQUIRED TO MOVE SLIDE-VALVES.

A correspondent over the signature of "Occident" criticises our article on the above subject, and modestly pronounces our conclusions "impotent and lame," before giving them any consideration whatsoever. He says he "denies, altogether, that the size of cylinder-ports has anything to do with the pressure," which denial, if it is any satisfaction to him, we would be the last to deprive him of. We honestly confess that we do not know exactly what the relation is between either the size or the shape of the openings and the pressure on the valve, but if "Occident" means that the pressure of the valve on its seat is the same whether there are any openings in the latter or not, why then we must recommend him either to try the experiment and thus find out for himself, or else give more heed to the testimony of others who have done so. If there are no openings in the valve-seat, he will find, what has long been known, that a valve, no matter how perfectly the facings are fitted, will move as freely in steam of a pressure of 100 pounds per square inch as it will in the ordinary atmosphere.

"Occident" proposes to prove something—we are not quite sure what—by "taking two perfectly true, smooth, non-porous surfaces, of metal or glass, well lubricated and worked together upon the surface to expel all the air, and those two pieces cannot possibly be pulled apart, though they may be slipped one way or the other." In reply to this statement it might be said that the result will depend entirely upon how hard you pull, and, second, that it is a practical impossibility to make "two perfectly true" surfaces. The reason why a boy's sucker will stick to a brick is that the leather being wet and soft, on being pressed down conforms to the inequalities of the brick, and thus becomes air-tight. The same thing occurs when there is an opening under a slide-valve containing a less pressure than that on top of it. The pressure on top then presses it down on the face, so as to expel any air that then may be between them, and makes a joint either perfectly or partially steam tight. If any steam leaks in between the two faces, it immediately escapes through the opening, thus maintaining a less pressure between the faces. If it could not thus escape the steam that would get between the valve and face would soon cause as high a pressure above as below the valve. We therefore state distinctly that in order to get any pressure on a slide-valve there must be an opening of some kind under it so that the steam can escape. Just how much the pressure is increased by enlarging this opening we do not know, nor do we believe that "Occident" does. If he knows, we trust he will enlighten us and our readers.

With reference to the pressure under the valve, he admits that the back pressure counterbalances that on the top of the valve. He must admit that the same thing is true whenever the port is filled with steam and is covered by the valve, and inasmuch as with all valves having both lap and lead both compression and suppression take place, they are obviously elements which must be taken into consideration in order to arrive at a true solution of the problem. It is true that back pressure is a greater evil than pressure in the valve, but, unfortunately, it is an evil which no ingenuity has thus far been able to obviate with ordinary slide-valves.

With reference to the new valve which has been tested at Burlington, all we can say is that, if a "gain of fully one-third of the power" is "a moderate statement" of the advantages due to its use, the inventor of it has a "good thing."

A PLAN FOR CANAL-BOAT PROPULSION.

The question of canal-boat propulsion has been recently revived and made one of more than ordinary interest, the New York Legislature having enacted a law offering large inducements to inventors for improvement in this direction, and already a number of plans have been submitted. Mr. Julius Hornig, a Chicago inventor, and a scientific engineer, has perfected and patented a plan which he believes to be entirely novel, and capable of economical application. His proposition is to lay a single rail track along the bank of the canal, inside of the space usually occupied by the tow-path, and to run upon this track a heavy truck, with wheels fitting to the rail in such a way as to secure sufficient frictional adhesion to draw the boat. The motive power, which is furnished by an engine on board the boat, is transmitted through a horizontal transmission shaft, or tumbling-rod, *D*, in the figure, which projects from the side of the boat, *E*, at right angles to a line drawn from bow to stern. A pulley, *P*, at the end of this transmission shaft is directly over the track, and power for the propulsion of the truck is transmitted by means of an endless chain, *C*, from this pulley to one upon the truck.

Mr. Hornig's patent covers two forms of truck: One in which the truck-wheels are double-flanged, rolling astride the rail, and securing adhesion, as in the case of the friction clutch. In this form the truck pulley—to which power from the shaft and the boat is applied by means of the endless chain—is fastened to the axle of one of the driving-wheels, and the two driving-wheels are connected by a connecting rod, or by spur gearing. Experiments with a model have, however, convinced the inventor that another method of connecting the driving-wheels is more economical and secures greater flexibility: The drivers are connected to the pulley and shaft, as before, and are provided with spurs which gear into an endless chain—known as a "traction chain"—which passes about the circumference of both drivers and rolls upon the track. The driving-wheels, in this plan, do not touch the rail. The rail is nearly of a *A* form, and the links of the traction chain are so shaped as to fit and grasp two surfaces of this rail.

Cranes are to be placed upon the canal boat, by means of which the truck can at any time be lifted from the track and swung on board; and, also, the projecting arm, supporting the transmission shaft, is to ride loosely in "shoes," so that the whole apparatus may be drawn on board, when the boat enters a lock, or when, for any reason, the space is limited.

The smooth, continuous rail-track will not in any way interfere with the present mode of canal propulsion, should it, on occasion, be necessary to resort to it. The rails may be laid on both sides of the canal—instead of tow paths—within the excavation limits, and without narrowing the serviceable width of the canal. Under bridges, through tunnels and in cities, where no tow-path is admissible, this method is entirely applicable. The rail, being smooth, will, when necessary, allow a tow line to glide unobstructed along it, and it may readily be cleared of obstructions.

The propelling apparatus may be made light and compact and will furnish great tractive power without abrasion, and will, therefore, require only a light rail, so that the wear and tear will only fall on parts of the apparatus which may be kept in duplicate, and easily replaced.

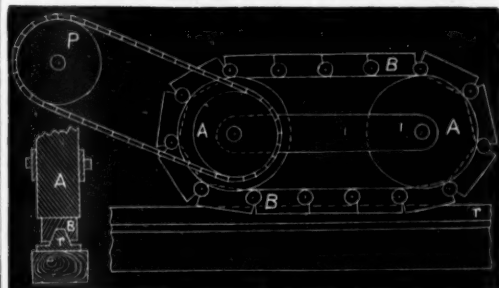
The use of the traction train furnishes an extended surface of contact for grasping the rail, and as the chain is laid down on the track and lifted up by the wheels, acting as gears, it forms a continuous rack, which adapts itself to all curves and admits of side tipping of gears and carriage—caused by rocking of the boat—without releasing its grasp or or changing its contact surface with the rail.

Either forward or backward motion can be secured at once by this apparatus, by starting or reversing the engine on the boat. This sudden reversion can scarcely act detrimentally, either to the apparatus or the rail, as the surfaces in contact will slide upon each other when the limit of adhesion is reached, and act for a time simply as a friction brake.

A little study of this method of propulsion will suggest the ready connection and disconnection with the rail, by simply lifting the carriages, which is aided by free guide-wheels in laying the chain on the track; also the facilities for increasing the pressure on the carriage and on the track, when greater traction is required, by appliances for reversing the action of the crane, and transferring a portion of the pressure of the boat to the carriage. Pilots, scrapers or revolving brushes may be attached to the forward ends of the truck to keep the rail clean and derive its greatest adhesive qualities.

The greatest possible capacity of the present canals can be attained by adapting the mechanism to tug boats, drawing a train of canal boats in each section, so that only the boats, carrying freight to their fullest capacity, need pass the locks.

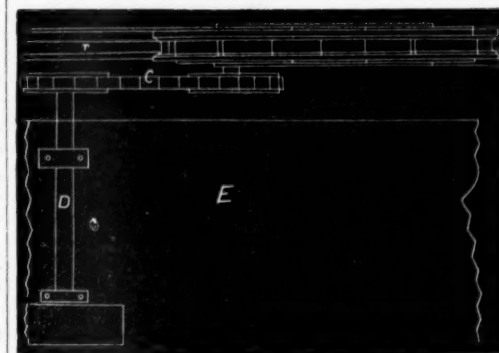
Mr. Van R. Richmond, New York, State Engineer, is authority that canal boats, on the Erie Canal, of 210 tons burthen, have 428 lbs. resistance when propelled at the rate of two miles per hour, or that there is 156½ lbs. pulling strain for each horse. On the Languedoc Canal, in France, 143½ lbs. per horse for six consecutive days was indicated. Accepting the law that the resistance increases as the square of the speed, the resist-



ance at a speed of four miles per hour would be about 1,700 lbs., or it would require 12-horse power to maintain it, though Tredgold (On Navigation) rates 13-horse power as necessary for this rate of speed.

Experiments made with wedge surfaces of cast iron fitting each other show a marked increase of friction over plane surfaces where the pressure is perpendicular to the surface, varying as a function of the angle of the wedge. This friction, expressed in percentage of the weight, is, approximately, for 180°, or a plane surface, 17 to 20 per cent.; for 90° it equals 23 per cent.; for 60°, 37 per cent.; for 45°, 50 per cent.; for 30°, 75 per cent.; for 25°, 87 per cent., and for 20° it is probably 100 per cent. Mr. Hornig's experiments with a model made for the purpose show a friction, or traction, for brass surfaces of 22 per cent. for 180°, 50 per cent. for 45° and 83 per cent. for 24°.

From these results it will appear that the propelling mechanism, acting on a rail, peaked at an angle of about 17°, can be relied on for at least 100 per cent. of traction adhesion, and, at 1,700 lbs. pressure of carriage upon the track, will draw a canal boat at a speed of four miles an hour, while its action cannot be detrimental to the rail if it offers ten square inches of surface contact. As designed with a chain, each link will present about six square inches of surface to the rail, and, passing over the two chain-wheels, this will doubtless prove more than sufficient. The pitch diameter of 24½ inches of the chain-wheels will give, at 80 revolutions a minute, without slipping, a speed of four miles per hour. Such a mechanism



will weigh about 2,600 pounds, and exert a pressure on the rail of about 2,000 pounds. As before remarked, this pressure can be increased or diminished by means of the crane connecting with the boat.

It is proposed to make the wheels, *A A*, of the carriage of cast-iron, with the surfaces chilled where they come in contact with the rail—in the first method proposed—or with the propelling chain, in the second method. The propelling chain, *B B*, will be of malleable iron, and a steel-plate chain, *C*, will connect the transmission shaft with the pulley, or drum, on the carriage. Suitable teeth will be keyed into the cast-iron chain-wheels to work in the traction chain as a rack.

In the first method proposed—using a combination of spur gearing and chains—the gears will be of cast-iron, and their bearings will be cast-iron bearing-boxes, babitted and riveted to the wrought-iron carriage-frame.

This mechanism may be applied to canal-boat propulsion in two ways: either with a twelve-horse-power portable engine on the deck of each boat, with complete traction arrangements, which may be transferred

to the deck when necessary; or a tug-boat may carry an engine of thirty or more horse-power, and, with a propelling apparatus proportionally strong, can draw two or three boats. These tug-boats can be kept in service in each section, and only the freight-boats need pass through the locks.

When designed for special boats, the arm bearing the transmission shaft will require a sleeve coupling and sliding outer bearing in order that the entire apparatus may be drawn on deck; and, beside the crane and screw-lifting arrangement, a connection from the rear of the carriage to the boat should be made to operate as an automatic steering and steadying apparatus.

The engine shaft may be provided with a drum to serve as a capstan in hauling the boat in and out of locks by means of ropes suitably attached on shore.

In order to test the practicability of this device, and not interfere with the navigation of the canal under the present system, it is proposed to lay a cap timber and iron rail on piling at the bank of the canal opposite the tow-path.

Pittsburgh, Cincinnati & St. Louis.

By a recent arrangement with the Louisville, New Albany & Chicago, the Jeffersonville, Madison & Indianapolis and the Michigan Central companies, this company now controls all passenger business from Chicago to Indianapolis, Louisville and Cincinnati. It runs cars both by the new and by the old route to all these places. In using the New Albany road, the cars from Chicago leave the Pittsburgh, Cincinnati & St. Louis Railway at La Crosse, 67 miles southeast of Chicago. The through cars leave the Albany road at Lafayette, and run over the Indianapolis, Cincinnati & Lafayette road, the Louisville car turning from this line at Indianapolis to the Jeffersonville road. By this route the distance to Louisville is 303 miles—15 miles less than by the former Michigan City route. The distance to Lafayette is 131 miles; to Indianapolis, 195 miles; to Cincinnati, 310 miles. Trains for these points leave the Pittsburgh, Cincinnati & St. Louis depot in Chicago at 9 a. m. and at 8 p. m., the latter train having sleeping cars attached for Indianapolis, Louisville and Cincinnati.

Meanwhile, the trains by the old route are maintained. The distances by this—the old—route are: to Indianapolis, 192 miles; to Louisville, 300 miles; to Cincinnati, 294 miles. Trains by this route leave Chicago at 7:40 p. m. for Cincinnati and for Indianapolis (via Kokomo), at 12:25 p. m. for Columbus, at 7:40 p. m. for Indianapolis, Cincinnati and Columbus, with a sleeping car for each.

The result of this arrangement, as we understand it, is, that the Jeffersonville, Madison & Indianapolis road gets all the Louisville business from Indianapolis southward, while the New Albany road has it all between LaCrosse and Lafayette. The Pittsburgh, Cincinnati & St. Louis has a haul of 67 miles on all Louisville business, and gives equal facilities for Cincinnati business to the two routes, on one of which is over 67 miles and the other over 223 miles of its line, and also by the two routes to Indianapolis, of one of which it forms 67 miles and of the other 138 miles.

Trains on this road reach the city as follows: From Columbus and Cincinnati at 10:55 p. m.; from Pittsburgh, via Columbus (sleeping car), at 9:20 a. m., from Cincinnati and Indianapolis, via Kokomo, (with sleepers) at 7:25 a. m.; from Louisville, Indianapolis and Cincinnati, via Lafayette and LaCrosse, at 8:00 p. m., and at 11:00 a. m., the latter with sleeping cars from each place named;

The Lansing accommodation leaves the city at 4:10 p. m. and arrives at 7:35 p. m.; the Dolton accommodation leaves at 9:50 a. m. and arrives at 2:00 p. m.

The Rockford, Rock Island & St. Louis Railroad.

From the organization of this company, among the most prominent men in its directors, who have been most active in carrying through the project, were Judge George Greene, of Cedar Rapids, Iowa; James R. Young, of Chicago, and H. H. Boody, of New York. Judge Greene, who was the first President, retired after the completion of the road from Sterling to Rock Island, we believe, and since that time Mr. James R. Young, first as Vice-President and afterwards as President, has had the active management of the company's affairs. On the 9th inst. five of the nine directors chosen last October, Messrs. James R. Young, of Chicago; H. H. Boody, D. A. Boody, and O. D. Ashley, of New York, and David Turnbull, of Monmouth, resigned. In their places were chosen R. R. Cable, C. Lynde, Jr., Miles Lee, and J. M. Buford, of Rock Island; Hiram Cable and G. W. Cable, of Davenport, and B. Stickney, Sr., of St. Louis.

A number of these gentlemen are interested in the Peoria & Rock Island Railroad Company, among them, we believe, the Cables, Mr. R. R. Cable having been the Superintendent of that railroad, and Mr. Lynde its Secretary and Treasurer. In the new Rockford directory R. R. Cable is President and C. Lynde, Jr., Treasurer.

The New Wisconsin Aid Law.

In the winter of 1860, the Wisconsin Legislature enacted a law, known as the "Esterly Bill," providing for votes of aid to railroads, by which the amount subscribed by towns and cities were to become a first lien on the roads. It was found that capitalists were not ready to lend money on second mortgages, and a change was made by the last Legislature, which the Milwaukee News describes as follows:

"The last Legislature passed an act, ostensibly amendatory of that of 1870, but, in reality, it is a new law, hardly any of its substantial provisions being identical with those of the act which it purports to amend. This law provides that towns, cities and villages may call special elections to vote aid to railroads, in the same manner that other special elections are called. Bonds can be voted and issued in payment for railroad stock, and the stock may be held or sold for the benefit of the town, city or village to which it belongs. On this vote to issue bonds, a majority of all the voters voting at that election is required, and this number is also required to be equal to a majority of the whole number of votes cast at the next previous annual election.

"The license fee, or annual tax, upon railroads constructed by the aid of these bonds, is fixed at five per cent. of their gross earnings; and when this sum is paid into the State Treasury, it is to be set aside to those towns, proportionately to the amount of debt incurred by each of them. This sum of money, so set apart to the towns, shall be used to pay the interest on the bonds and the principle as it becomes due. If this amount is insufficient for that purpose, the Secretary of State is required to apportion with the State tax on such towns, cities and villages an additional tax to supply the deficiency. The State is made the custodian of the funds created by the license fees, and by taxation for the payment of the interest and principle of the bonds issued under the act. It is declared that the State shall not be liable for the payment of the bonds, beyond the amount of which it is the trustee for that purpose. In fact, and under the constitution, it is not, and cannot be made liable to this extent, nor to any other. Towns, cities and villages are restricted as to the amount of debt which they may create according to the law, which must not, in any case, exceed five per centum of the assessed valuation of the taxable property which it contains."

Private Railroad Tracks in Massachusetts.

The following is the text of an act authorizing the construction of railroad tracks for private use in the transportation of freight, recently passed by the Massachusetts Legislature:

SECTION 1. Any person or corporation may build and maintain a railroad track for private use in the transportation of freight, subject to the provisions of this act.

Sec. 2. No such track shall be connected with the tracks of a railroad corporation without the consent of the corporation.

Sec. 3. No such track shall be constructed across or upon a highway or town way, except with the consent of the board of mayor and aldermen or selectmen of the city or town in which such way is located, and in a place and manner approved by them. Said board or selectmen may make from time to time such regulations in regard to the motive power to be employed, the rate of speed to be run, and the time and manner of using the track, over and upon such way, as in their judgment the public safety and convenience require; and may order such changes to be made in the track as are rendered necessary by the alteration or repair of such way.

Sec. 4. If steam power is allowed to be used on such track, the provisions of all general laws relating to the crossing of ways by railroad corporations shall apply to such track and the person or corporations operating the same.

Sec. 5. Nothing contained in this act shall be construed to authorize the taking or use of lands or other property without the consent of the owner thereof.

Sec. 6. This act shall take effect upon its passage.

The New Jersey Lease.

The following is said to be the terms which the Philadelphia & Reading Company offers for the lease of the property of the United Companies of New Jersey:

First: The Reading Company will take the Delaware & Raritan Canal on a perpetual lease, paying \$750,000 per annum, and increasing the amount of the payments until they shall reach \$1,000,000 per annum. Second: The Reading Company propose, in case these terms are not accepted, to take all the property of the United Companies, representing \$35,245,000, actual cost, and to pay 10 per cent. dividends yearly, and a bonus of \$1,000,000.

The question of leasing to the Pennsylvania Company will be submitted to a vote of the stockholders of each of the New Jersey companies. The assent of two-thirds (in amount) of the stockholders of each company is made necessary, by the terms of a New Jersey statute of 1870, to authorize the leasing of any road.

—A new propeller of the Union Steamboat Company, the Wm. M. Tweed, was launched at Buffalo, last week, and will at once take her place on the line between Buffalo and Chicago. Her keel is 216 feet long, 228 feet "over all"; breadth of beam, 33 feet; depth of hold, 14 feet. Her capacity is about 1,400 tons, new measurement, and her cost, \$95,000.

Chicago Railroad News.

Chicago, Rock Island & Pacific.

The annual meeting of the stockholders for the election of directors will be held at the office of the company in Chicago on Wednesday the 7th day of June next at 11 o'clock a. m.

The final location of a road from Washington, Iowa, west to Sigourney, has been made, and the company have decided to build it. The distance is about 28 miles, and the road will be built as a branch of the Rock Island road. Preliminary lines for an extension west to Oskaloosa, on the Central of Iowa, have been run, and with sufficient "encouragement" from the citizens of Oskaloosa, this extension will be built. The company expect to complete the branch as far as Sigourney within the next eighteen months.

Very few changes for the summer time-table, which takes effect to-morrow, are to be made. The through trains leave as before, and the Pacific express arrives at 3:15 instead of 4:15 p. m. The dummy train, running to Blue Island, will leave at 6:30 and 8:45 a. m., and at 5:00 p. m. The 8:45 train, which formerly ran only to the Rock Island Shops, will run to Blue Island. The Blue Island trains will arrive here at 8:45 a. m., and 1:25 and 7:15 p. m.

Pittsburgh, Fort Wayne & Chicago.

By the new time table which went into effect last Sunday, trains leave Chicago exactly as before—that is at 5:30 and 9 a. m. and 5:15 and 9 p. m. There is also but little change in the running time, the train leaving Chicago at 9 a. m. reaching New York at 6 p. m. instead of 6:30, and the night express arriving at that city at 10:00 instead of 10:30 a. m.

Lake Shore & Michigan Southern.

The mail train now leaves here at 5:40 instead of 5:30, a. m. The New York express leaves at 9:00 a. m., as before, but arrives in New York at 6:30 instead of 7:00 p. m., and in Boston at 11:20 instead of 11:45 p. m.

Illinois Central.

By the new time-table, the fast train, which leaves here at 8:15 p. m., arrives at St. Louis at 7:45 a. m., 15 minutes earlier than formerly; the Champaign passenger leaves at 5:15 p. m., instead of 4:50; and a new train, for Kankakee, leaves here at 11:00 p. m., and arrives at Kankakee at 1:55 a. m. Several changes and additions have been made to the time table of the Hyde Park trains, which will hereafter leave the city at 6:15 and 9:45 a. m., and at 12:10, 3:00, 5:15, 6:10 and 11:00 p. m. The arrivals will be at 7:17, 9:00 and 11:00 a. m., and at 1:45, 5:15 and 4:35 p. m.

The company reports earning for the month of April, as follows:

LAND DEPARTMENT.			
Acres construction lands sold	3,740.26	for	\$37,132 14
Acres interest fund lands sold	120.00	"	1,212 30
Acres free lands sold	44.63	"	930 67
Total sales during month of April, 1871.	3,904.79	for	\$39,275 01
To which add town lot sales			464 18
Total of all	3,904.79	for	\$39,739 19
Cash collected in April, 1871.			\$129,841 56

ESTIMATED EARNINGS—TRAFFIC DEPARTMENT.

	In Illinois, 707 miles.	In Iowa, 402 miles.	Total, 1109 miles.
Freight	\$307,489 00	\$256,416 00	\$563,905 00
Passengers	118,061 52	40,319 95	158,381 47
Mails	6,375 00	3,059 33	9,434 33
Other Sources	54,000 00	2,940 67	56,940 67
Total, April, 1871.	\$485,925 52	\$302,735 95	\$788,661 47
Total actual earnings, April, 1870.	\$455,323 68	\$299,723 24	\$755,046 92
Increase	30,601 84	\$2,972 61	\$33,574 45

An increase of 7 per cent. on the Illinois lines, of 3 per cent. on the Iowa lines and 6 per cent. in the entire earnings from the traffic department.

The annual meeting of the shareholders of this company for the election of directors will be held at the office in Chicago on Wednesday, the 31st inst., at noon. The transfer books are closed from May 13 to June 1.

Chicago & Northwestern.

The company makes the following statement of receipts and expenditures for the ten months of the fiscal year ending March 31:

	1869-70.	1870-71.
Gross earnings	\$10,423,453 50	\$9,811,171 63
Decrease in 1870-71	\$627,281 88	= equal to 5 92-100 per cent.
TOTAL CURRENT CHARGES.		
	1869-70.	1870-71.
Operating expenses	\$6,581,990	\$5,261,124
Taxes	885,023	336,899
Int. on bonds and int. on exchange	950,000	916,171
Working funds	45,130	45,130
Div'ds paid on C. & M. R. R. stocks	1,608	994
Rent on Iowa roads	876,297	791,433
Total	\$8,858,233	\$7,387,339
		\$1,562,894

Saving in the above items in 10 months, in 1870-71, \$1,562,894.56, equal to 17 65-100 per cent.

At this rate the receipts of the current year will be about \$11,780,000, or \$750,000 less than in 1869-70, and the expenditures will be reduced by something like \$1,875,000, so that the increase in net earnings will be more than \$1,100,000, which by itself is sufficient to pay a three-per-cent. dividend on the entire stock of the company. To make such an increase in profits in the face of a decrease of nearly six per cent. in receipts, is one of the most brilliant feats of railroad management on record.

Chicago & Alton.

By the change in time table, to take effect on next Sunday, the 4:00 p. m. Joliet accommodation will leave ten minutes later; the 5:30 night express will leave at 6 o'clock, and run through to St. Louis every night. This train formerly stopped at Bloomington Saturday nights. The lightning express, leaving here at 9:00 p. m., will also run through to St. Louis every trip.

Track-laying on the Louisiana Branch was begun at Roodhouse last week and is progressing at the rate of a mile a day. At the same time the track-layers on the Louisiana & Missouri River road began work west from Louisiana, and are laying a little less than a mile a day.

The Pullman Company.

On the 11th of May a two story brick car shop, one of the buildings of the company's car works at Detroit, was burned, and on the next day a contract was made for its re-erection, in substantially the same form as before, to be entirely completed within two weeks from that time, so that the interruption to business will only extend to the close of next week.

As a natural sequence of securing control of the Southern sleeping car lines, the Pullman Company commenced last Monday running their cars between St. Louis & Memphis over the St. Louis & Iron Mountain Railroad. A palace car line will soon be established on the Lake Superior & Mississippi road, between Duluth and St. Paul, and the company will have their lines complete from Lake Superior to the Gulf of Mexico.

Personal.

It is reported that Mr. Walter Katte, Engineer and Western Agent of the Keystone Bridge Company, is about to move his office from this city to St. Louis. Mr. Katte has been at Pittsburgh for a few days past, and will return here early next week.

W. J. Fell, Local Freight Agent in Chicago of the Pittsburgh Cincinnati & St. Louis Railway, died on the evening of the 16th inst., at his residence, No. 387 West Randolph street. His remains were taken to Columbus, O., where he formerly resided, for interment.

Mr. T. L. Kimball, General Ticket Agent of the Union Pacific Railroad is in the city for a few days.

Chicago to Buffalo.

Since May 15 a sleeping-car is attached to the Great Western's train leaving Detroit at 7 p. m., and runs through to Buffalo by way of Suspension Bridge and the Erie Railway's extension from Buffalo. Attached to the day express, which leaves Detroit at 7:30 in the morning, is a Pullman parlor car which runs through to Buffalo by the same route. The Great Western's trains now connect three times a day with the Erie road for Buffalo.

Boston to Chicago.

The Boston & Albany Railroad Company began, last Monday, running an "Independent fast express train," connecting with the fast express on the Central Route and making the time between Boston and Chicago 35½ hours. The train leaves Boston at 8:30 in the morning and arrives in Chicago at 7 o'clock the next day in the evening. Under the old arrangement passengers were obliged to wait at Albany for the night train.

REGISTER OF EARNINGS.

FOR THE MONTH OF APRIL.

Michigan Central (284 miles), 1871.	\$422,797 71
" (284 miles), 1870.	412,030 43
Increase (2½ per cent.)	\$10,767 29
Earnings from all sources.	\$470,703 15
St. Louis & Iron Mountain (210 miles), 1871.	\$129,590 14
" (210 miles), 1870.	102,622 49
Increase (26¼ per cent.)	\$26,967 65
Central Pacific (89 miles), 1871.	\$756,250 00
" (742 miles), 1870.	633,758 00
Increase (20 per cent.)	\$122,492 00
Toledo, Wabash & Western (682 miles), 1871.	\$444,210 00
" (821 miles), 1870.	318,699 00
Increase (40 per cent.)	\$125,511 00
Illinois Central (1109 miles), 1871.	\$788,661 47
" (974 miles), 1870.	555,087 02
Increase (6 per cent.)	\$33,574 45
Maricetta & Cincinnati (251 miles), 1871.	\$118,173 00
" (281 miles), 1870.	106,246 00
Increase (11¼ per cent.)	\$11,927 00
Milwaukee & St. Paul (10½ miles), 1871.	\$483,884 00
" (936 miles), 1870.	443,133 00
Increase (9 per cent.)	\$40,751 00
Chicago & Alton (511 miles), 1871.	\$393,654 00
" (466 miles), 1870.	348,139 00
Increase (13 per cent.)	\$45,515 00

The New Vanderbilt Passenger Station in New York.

This great structure is to be completed in July. The New York Times says of it: "About one-third of the roof surface is of malleable plate-glass. This, with the white paint on all the iron-work, as a reflector, will render the space within below brilliant with light. The tracks inside—of which there are ten—are being laid and filled in with russia pavement. The platforms, of solid blue-stone masonry, are also in course of construction. They are about two feet above the track level and of ample width. The glass is in all the office windows, and joiners are finishing the wood-work of the rooms. An exceedingly light and prettily designed iron verandah covering the entire sidewalk, extends along a portion of Forty-second street."

General Railroad News.

OLD AND NEW ROADS.

Boston, Hartford & Erie.

The trustees have issued a circular requesting the bondholders to subscribe a sufficient sum to pay off the demands of the Receivers.

Newark & New York.

This railroad, one of the costliest in America, crossing over or under all streets and roads, has been leased in perpetuity by the Central Railroad of New Jersey, whose shareholders form the Newark & New York Company. The road is but eight miles long and cost with equipments, \$2,342,306—nearly \$300,000 per mile. The rental is 7 per cent. per annum on the cost of the road, which would necessitate net earnings of \$21,000 per mile to pay.

Ironton, Portsmouth & Cincinnati.

This company, which proposes to connect Cincinnati with the Chesapeake & Ohio Railroad by a line along or near the Ohio River, has appointed committees to open books and solicit subscriptions in the counties along the line.

Pittsburgh, Cincinnati & St. Louis.

A telegram from Indianapolis says that the above company has decided to establish new and extensive shops for construction and repairs in Indianapolis.

Houghton & Ontonagon.

A preliminary survey has been made, and an easy route found for a railroad from the eastern end of Lake Michigamie and the head of L'Anse Bay.

Ottawa, Oswego & Fox River Valley.

A telegram from Ottawa, Ill., dated May 15, says: "Some excitement has been created here by the discovery that the bonds of the several towns, cities, etc., along the Ottawa, Oswego & Fox River Railroad are void, owing to a non-compliance with the law, which entitles townships, counties, etc., subscribers to the stock of railroads to have one-fourth of the directors of the roads to which they have subscribed. No such directors having been appointed in this case, Governor Palmer has so notified Mr. Lynch, of the committee appointed by the Supervisors of the interested townships in LaSalle, Kendall and Kane counties."

Canada Air Line.

The President of this company, Hon. Thomas Dakin, Lord Mayor of London, in his speech at the semi-annual meeting in London on the 12th ult., after stating that the 103 miles of the Canada Air Line between Glencoe and Canfield were under construction, all to be completed by the end of the year, said:

"Now, with regard to the remaining 46 miles from Canfield to Fort Erie, there was already a single pair of rails laid down by the Grand Trunk Company, but it was quite certain that a single pair of rails never would be sufficient to carry the traffic of the two companies from that point into Buffalo, and therefore they had endeavored to come to an arrangement with the Grand Trunk Railway Company on the subject, of making a second line of rails within the fences of the Grand Trunk on paying the latter company a reasonable amount for the land so occupied. When the narrow gauge from Sarnia was made they would have to arrange for the use of the two lines when constructed. They had not yet been able to arrange with the Grand Trunk about these 46 miles. If they should not be able to make an arrangement with the Grand Trunk they must make a line of their own. They had the means of making those 46 miles so as to be ready by the time the International Bridge at Buffalo was built, otherwise the new line would be useless. The bridge would be built about the end of next year; it was a most important undertaking, and there was no doubt that it would be completed. The bridge charter, under which it was now being built, would make it a postal road subject to rates and tolls. They might either become part owners of the bridge or pay tolls for passing over it."

Peoria & Rock Island.

The track was to be laid on the western division of this road as far east as Cambridge, Henry County, early this week.

St. Louis, Vandalia, Terre Haute & Indianapolis.

A new time table went into effect on the 14th inst., by which there are two passenger trains running daily between St. Louis and Indianapolis, an accommodation and mail between St. Louis and Terre Haute, besides the Chicago express running between St. Louis and Effingham, and an accommodation train and a mail train between Terre Haute and Indianapolis. Trains leave St. Louis for Indianapolis at 8:45 a. m. and 6:40 p. m., arriving in Indianapolis at 6:40 p. m. and 3:35 a. m. The Chicago express leaves at 7:55 a. m. and arrives at the same time. The mail for Terre Haute leaves at 4:20 p. m. The New York trains arrive at 5:40 a. m. and 1:40 p. m.

St. Paul & Sioux City and Sioux City & St. Paul.

We are informed that the line between St. Paul and Sioux City, commonly known as the St. Paul & Sioux City Railroad, is the property of two companies, the St. Paul & Sioux City Company owning the part of the road completed, from St. Paul to St. James, 123 miles, and the Sioux City & St. Paul Company having under construction the 151 miles from St. James to Sioux City, 50 miles of which will be built by August next, and the remainder by the fall of 1872.

Chicago & Illinois Southern.

This railroad (embracing, we believe, the line formerly known as the Mattoon & Grayville) is making healthy progress from Mount Vernon, on the Ohio River a little below Evansville, and near the southwest corner of Indiana, northward. The track is down for five miles

north of Mount Vernon, and most of the grading is done to New Harmony, on the Wabash, and the bridge over the Wabash at Grayville, 12 or 15 miles further up and 25 miles from Mount Vernon, is well under way. It will extend thence a little west of north through Albion, the county seat of Edwards County, Ill.; Olney, the county seat of Richland; Newton, the county seat of Jasper, and Prairie City, the county seat of Cumberland, to Mattoon, in Coles County, the crossing of the Illinois Central and the Indianapolis & St. Louis railroads. The total distance from Mount Vernon to Mattoon is 123 miles, and the route is nearly parallel with, and from 18 to 30 miles distant from, the line of the Springfield & Illinois Southeastern. The subscriptions of towns and counties on the line are said to amount to \$1,575,000, and the company is now offering 8-per-cent. bonds, which are authorized at the rate of \$19,000 per mile. Horace Hayward, of Olney, Ill., is President of the company.

Cincinnati & Mackinaw.

Cincinnati already reaches as near to Mackinaw as any other place through the Fort Wayne, Muncie & Cincinnati and the Grand Rapids & Indiana roads, but it seems anxious for a line outside of Indiana. The Cincinnati Railroad Record announces that representatives of the Cincinnati, Hamilton & Dayton Railroad Company have agreed with those interested in the old Cincinnati & Mackinaw route, that if the latter will provide ground, right of way, grading, culverts, bridges, ties and \$1,000 per mile for a railroad from Eaton, in Preble County, O., 53 miles from Cincinnati on the Richmond line of the Cincinnati, Hamilton & Dayton, due north to Van Wert, on the Fort Wayne road, a distance of 65 miles, the Dayton Company will then iron, equip and operate it; or it will accept first a section from Eaton to Greenville; second, one from Greenville to Celina, and third, one from Celina to Van Wert. Having completed the road to Van Wert, there would remain to be built a line just about the same length from Van Wert north to Jonesboro, Mich., where connection might be made with the Fort Wayne, Jackson & Saginaw road, which is already making its way with good speed from Saginaw towards Mackinaw.

The property of the old Cincinnati & Mackinaw Company, consisting chiefly of right of way, was sold by order of court in Greenville, Ohio, on the 6th inst. for \$11,333 to John S. Winner, Thomas Turpen, S. R. Stimpson, Charles Matchett and—More, residents of Greenville and other towns on the line.

Connecticut Valley.

Mr. A. H. Wright, of Greenfield, Mass., has taken the contract for laying the track on this road from Hartford down the Connecticut River to Saybrook, a distance of 50 miles, which he is to complete in August.

Toledo & Tiffin.

The Toledo (O.) Blade of the 12th says: "The contract signed on last evening by the Railroad Trustees of the city of Toledo stipulates that, in consideration of a lease of the Toledo & Woodville Railroad, the Mansfield and Tiffin parties, in connection with the Pennsylvania Railroad, agree to construct a line of railway extending from the Michigan State line, through Toledo and Tiffin, to Mansfield, Ohio. The road-bed is to be ready for the iron within twelve months from the 4th of May, 1871; but the intention of the contractors is to have the line, from its intersection with the Dayton & Michigan Railroad, on the east side of the Maumee, to Mansfield, in running order by the 1st of January, 1872. When the road-bed is prepared for the iron, it is to be ironed, stocked and operated by the Pennsylvania Railroad."

Such a road would form a branch of the Ohio & Michigan Railroad, now under way from Mansfield through Tiffin, O., Coldwater and Battle Creek, Mich., to Allegan, Mich. From Toledo to Tiffin the distance is about 45 miles, but the Ohio & Michigan road can be reached at some point northeast of Tiffin, by a shorter line.

Fort Scott, Park City & Santa Fe.

This company proposes to build a road from Fort Scott, Kansas, toward New Mexico, passing through Bourbon and Allen counties to Humboldt, thence to Eureka, in Greenwood County; Eldorado, in Butler County, and to Park City, in the valley of the Arkansas.

Southern Pacific, of California.

The track is being rapidly laid south from Gilroy, the present terminus of the road, 80 miles from San Francisco, and the bridge over the Pajaro River, about six miles south of Gilroy, is completed, and construction trains are running over it and beyond.

Kansas Pacific.

The annual report was submitted by the Vice-President, Adolphus Meier, at the meeting in Lawrence on the 4th inst. Its most important statements are included in the "business summary and financial statement" made by the President and published in the RAILROAD GAZETTE of March 11. We extract the following from the report:

"The natural advantages of the routes from the cattle-producing regions of eastern and central Texas to the line of your road, the abundance of water and the almost unlimited supply of excellent grazing, and the freedom from the delays and annoyances encountered by those driving large herds of stock through the settled portions of Indian Territory and Kansas, will for many years lead a large proportion of the Texas stock, destined for Eastern markets, to strike the line of road at Abilene, Salina and Brookville, and as settlements hereafter encroach upon these great routes, the tendency will be for them to be moved to some point still farther westward on the line, thus continuing to give to this company the transportation of the stock.

"The experience of the past three years has demonstrated that this company is practically without a rival for the transportation of Texas live stock, and with the peculiar advantages of our position, and the increased facilities we are enabled to offer to this trade, it has

little to fear in the future from the extension of other lines. The cattle from western Texas and the extensive stock-growing country in New Mexico and Southern Colorado, will hereafter reach the road at Carson and points west. This region gives promise of furnishing a large business to the company in the transportation of stock, and although the road was only opened through to Colorado for a few months in the year, nearly 300 car loads of stock were shipped from Carson and Denver.

"You now possess a very valuable property, which from its geographical location must constitute a portion of one of the trunk lines across the continent. Your road practically controls the trade of a vast and productive country, and it now only requires careful and economical management to yield to its owners large returns.

"The true policy of the company will dictate the speedy construction of branch lines into the rich mineral-producing regions of the mountains, and a branch from Kit Carson southwestwardly to the fertile valley of the Arkansas and thence to the Rio Grande, in New Mexico. These branches will stimulate settlement and furnish an increase of business for the main line of road. Some of them will probably require the adoption of the narrow gauge. We commend to your earnest attention the measures needed to secure their construction."

Alabama & Chattanooga.

The line of this railroad from Chattanooga, Tenn., to Meridian, Miss., was completed on the 15th inst., by the spiking of the last rail at a point 12 miles south of Tuscaloosa, Ala. The same night the first through train started from Chattanooga for New Orleans. Cars are to run regularly on this line, using the Vicksburg & Meridian road between Meridian and Jackson, Miss., and the New Orleans, Jackson & Great Northern between Jackson and New Orleans. At Chattanooga connection will be made with the route via Knoxville, Bristol, Lynchburg and Alexandria for the Northwestern cities. This will be the shortest route between New Orleans and New York, the distances being as follows:

New Orleans to Jackson.....	183 miles.
Jackson to Meridian.....	95 "
Meridian to Chattanooga (Alabama & Chattanooga).....	306 "
Chattanooga to Lynchburg.....	446 "
Lynchburg to Washington.....	173 "
Washington to New York.....	123 "

Total distance.....1,436 miles.

A telegram from Chattanooga dated the 12th says: "Another meeting of the creditors of the Alabama & Chattanooga Railroad was held last night. The committee reported that the best that could be done was to take one dollar in stock and one dollar in bonds for each dollar of indebtedness, and so retire all the floating debt in this country, and thus enable Superintendent Stanton to pay off parties who were pressing the road into bankruptcy. A large amount of stock and bonds were subscribed in this way to-day. A petition was also circulated, and signed by representatives of \$500,000 of the floating debt, requesting the dismissal of the suit in bankruptcy."

The road received a subsidy of \$16,000 per mile from the State of Alabama, besides, we believe, a special subsidy which brought up the State aid to something like \$30,000 per mile.

Washington & Richmond.

A considerable force has commenced the grading of this road at Alexandria.

Pittsburgh, Virginia & Charleston.

The engineers are making a final location of the Pittsburgh end of this proposed line, and it is intended to let a section, and have it completed soon, from Pittsburgh southward to Elizabeth or Monongahela City. It will pass through very productive coal mines.

Springfield & Illinois Southeastern.

The citizens of Virginia, Ill., a city 30 miles from Springfield, on the northwestern extension of the Springfield & Illinois Southeastern road, gave a banquet and reception, one day last week, to the officers and employees of the company, at which the usual number of good things were eaten and said. The extension was completed through to Beardstown on the Illinois River, about 12 miles from Virginia, in a month or less.

Rockford Central.

The officers of the company are actively engaged in securing subscriptions for the road, and are negotiating with the Sugar Valley—Wiaconsin—Company, which has a road in operation from Madison to Portage City, to build the two roads to meet at the State line, and from a part of the proposed north and south line. The manager of the Rockford road has also been in conference with the President of the Peoria, Pekin & Jacksonville Company, with a view to a prospective connection at Peoria.

Chicago, Dubuque & Minnesota.

The President, Mr. J. K. Graves, announces that he has contracted for 8,000 tons of iron, which will be sufficient to complete the first eighty miles of track. A locomotive is now on the line moving construction trains. The line is graded to the mouth of the Turkey River, 27 miles above Dubuque, where one line will diverge northwesterly up the Turkey River Valley, and the other keeps up the Mississippi. Contracts are let as far as McGregor, and it is intended to complete the river line to Winona, where there will be a river line from St. Paul to Dubuque and Bellevue.

St. Joseph & Iowa.

Negotiations are in progress for a consolidation of this company with the Burlington & Southwestern Company. The directors of the St. Joseph Company met on the 13th, and appointed a committee to go to Burlington and complete the work of consolidation. A stipulation is to be made that the construction of the

line is to be commenced at once at St. Joseph, and a certain number of miles completed northwestwardly.

Vicksburg & Brunswick.

Thirty miles of this road in Alabama, from Eufaula westward, in the direction of Camden, in Wilcox County, have been graded, and it is expected that twenty miles of iron will be laid by the 1st of July, entitling the road to the \$16,000 a mile given by the State. In addition to this aid, Wilcox County offers \$250,000 in bonds toward building the fifty miles of road in that county.

Walkill Valley.

There is a branch of the Erie Railway extending from Goshen, 59 miles from New York, north by east to Montgomery, ten miles. The Walkill Valley Company is engaged in extending the line down the Walkill in the same general direction to its mouth at Kingston on the Hudson, about 25 or 30 miles, whence it is intended to extend it up the west bank of the Hudson to Albany. The new road is open to New Paltz, 18 miles from Montgomery, and is under contract to be completed to Kingston next fall. The distance to Albany by this route, it is said, will be 147 miles, only four miles farther than by the Hudson River road.

Toledo & Louisville.

The directors of the company met at Greensburg, Indiana, on the 9th and ordered a survey and location of the road from North Vernon, on the Ohio & Mississippi road, north 71 miles to New Castle, Indiana, the present terminus of the Fort Wayne, Muncie & Cincinnati Railroad. By building this piece of road a very direct north and south line will be formed from Louisville to Michigan, by the Louisville Branch of the Ohio & Mississippi, the Toledo & Louisville road, and the Fort Wayne, Muncie & Cincinnati road to Fort Wayne, and from there northward by the Grand Rapids & Indiana Railroad.

Lawrence & Pleasant Hill.

The Lawrence Tribune has information that this road will be graded, ready for the iron, between the points named in its title, by the first of July next; and that it is expected to have the road completed by the first of November. The eighteen miles of the line between Olathe and High Blue are ready for the iron. Two hundred men are at work at the Blue crossing. The heaviest work on the line is at this point. It is all rock work and will not be completed till the grade is completed on the balance of the line.

Portland & Rochester.

This road, when completed, will be 51 miles long, from Portland, Maine, to Rochester, New Hampshire. The track-layers are now within ten miles of Rochester, and two locomotives, 30 cars and 130 men are engaged in the work of ballasting and laying track.

Dunkirk, Warren & Pittsburgh.

It is announced by the officers of this company that 32 miles of the road, from Dunkirk, on Lake Erie, south to Jamestown, are to be completed and ready for operation by the 4th of July next.

Omaha to Cincinnati.

Arrangements have been perfected by which, last Monday, through mail and express trains commenced running from Omaha and Council Bluffs to Cincinnati and Louisville; over the Burlington & Missouri River road, to Burlington; the Chicago, Burlington & Quincy, to Peoria; the Indianapolis, Bloomington & Western, to Indianapolis; and the Indianapolis, Cincinnati & Lafayette, to Cincinnati. The Atlantic express leaves Omaha, with a through car, at 4 o'clock in the afternoon and arrives at Cincinnati at 9:45 the next evening. Between Omaha and Galesburg this train will be supplied with the regular sleeping cars of the Burlington & Missouri River road. The mail train leaves Omaha at 6 o'clock in the morning and arrives at Cincinnati at 5:15 the next day in the afternoon.

Laclede & Fort Scott.

Mr. Hugh McCord, President of the company, at Lebanon, Mo., advertises for proposals to iron and equip the road from Lebanon, 128 miles, to Fort Scott. It is announced that the grading is so far advanced that track-laying may proceed uninterruptedly.

Nashville & Decatur.

The stockholders have ratified the contract for a lease to the Louisville & Nashville Railroad Company.

Wheeling, Pittsburgh & Baltimore.

The old Hempfield Railroad Company, whose property was lately purchased by the Baltimore & Ohio Company, was re-organized with the above name on the 3d inst. Wm. H. Hughart, President of the Pittsburgh & Connellsville, was chosen President, and John H. Page, Secretary. An extension, 28 miles long, to connect with the Connellsville road is to be made immediately.

Iowa Southwestern.

The promoters of this projected road (from Clinton west by south through Camanche and Iowa City to Oskaloosa and beyond) hope to have it completed to Iowa City, 65 miles, by July, 1872, and to Oskaloosa, 125 miles, by the end of that year. Between Clinton and Iowa City it will nowhere be more than ten miles from either the Rock Island or the Northwestern road. It is reported that it will connect at Clinton with the Chicago, Burlington & Quincy road through an extension of its Mendota & Prophetstown Branch.

Clinton, Iowa City and Oskaloosa, points on the proposed line of this road, have each voted in favor of a five-per-cent. tax in its aid.

Milwaukee, Manitowoc & Green Bay.

The Nord-Western, of Manitowoc, says that a meeting of the directors of the company was held on the 10th inst., preliminary to the active commencement of operations. It is stated that there is a good prospect that the company will soon be in possession of means sufficient for the construction of the road from Milwaukee as far north as Manitowoc.

Dubuque & Minnesota and Iowa & Pacific.

Officers of the latter company have recently returned from the East, where they met parties interested in the Dubuque & Minnesota road, and tried to make an arrangement whereby they could form a connection with the latter at the junction of the Volga and Turkey rivers, about 40 miles northwest of Dubuque, and construct their line thence westward, having the use of the Dubuque & Minnesota track into Dubuque. The Dubuque Times reports as follows the results of their efforts:

"We understand from a Chicago gentleman, who seemed to be posted as to the facts, that while the Eastern backers and friends of the Dubuque & Minnesota Railroad Company were willing to make the proposed joint trackage arrangement, they want to occupy a certain portion of the route which the Iowa & Pacific Company proposed to adopt, and to have the latter company start from a point further west. In other words, that the proposition is to change the route of the Dubuque & Minnesota Branch from the Turkey River route, and carry it up the Volga, and thence up Crane Creek, and on to New Ulm, Minn. This would force the Iowa & Pacific Company to start westward from some point in Fayette County not far from Fayette. We understand that if this proposition is accepted these Eastern parties stand ready to furnish all the money needed to push the work along with all possible celerity."

However this may affect local interests, it is plain that such an arrangement of routes would probably command the traffic of quite as much country with something like twenty-five or thirty miles less of road. And in this way the Dubuque & Minnesota would be fifteen or twenty instead of ten or twelve miles, from the Milwaukee & St. Paul, and there would be no interference between the Dubuque & Minnesota and the Iowa & Pacific, as there would, according to the old plan, by which the two lines would be, not more than ten or twelve miles apart twenty-five or thirty miles from their intersection.

Wiggins' Ferry Company.

This company, which controls the ferry business across the Mississippi at St. Louis, declared a dividend of 33 per cent. for the year past—18 per cent. from real estate and 14 per cent. from the profits of the business. Seven hundred feet of levee and two thousand feet of street have been constructed at East St. Louis during the year, and two new transfer boats, the "Creveling" and the "Bogy," have been built.

Gulf Branch of the Atlantic & Pacific.

The State of Texas has granted a charter for the "Mexico Gulf Branch of the Atlantic & Pacific Railroad." This grants to the company all the rights and advantages of the general railroad laws of Texas, which give sixteen sections of 640 acres each for every mile of road constructed. The road is to run from St. Louis to Sabine Pass through the States of Texas, Arkansas, Missouri and a portion of the Indian Territory. Sabine Pass is at the mouth of Sabine River, which separates Texas & Louisiana. If the junction with the main line should be made near the present terminus in Missouri close to the Kansas line, the branch would be a due north and south line just about 500 miles long. It can be made without entering the Indian Territory, and the country on the line is almost uniformly very fertile.

Pennsylvania Railroad.

The Treasurer advertises that the stockholders will have the privilege until June 2, 1871, of subscribing at par for one share of new stock for every six shares registered in their name on the 30th of April last. Holders of less than six shares may subscribe for a full share.

The Board has declared a semi-annual dividend of 5 per cent., payable on and after May 30.

Baltimore, Pittsburgh & Chicago.

The following is an extract from a report of a speech made at the monthly meeting of the Baltimore & Ohio directors in Baltimore on the 10th inst.:

"Great enthusiasm existed throughout the Northwest to secure in the interests of those vast regions the advantages of the Pittsburgh, Baltimore & Chicago line—as a grand competing route against the high charges and greater distances to New York—to Baltimore, their natural and most economical port on the Atlantic. Under the organization proposed, immediate and effective steps would be taken to decide upon the route, and secure early the construction of the road."

"The Chief Engineer of the Pittsburgh, Washington & Baltimore road (B. H. Latrobe, Esq.) had recently submitted a report in regard to the various lines that had been proposed in the interests of the several sections which are pressing for the selection of their respective routes. This report is highly favorable as to the low cost and large advantages of several of the proposed lines."

"As it will be the policy of the Baltimore & Ohio Company to make a large cash subscription to the stock of this road, and as it has been indicated that the remainder of the capital required could be promptly secured, the enterprise promised not only great advantages to the terminal cities and the intermediate and adjacent cities and territories, but the most remunerative financial results, especially in view of the very limited cost of the line when compared with the roads with which it would be brought into competition. It is, therefore, eminently judicious, in every aspect of the enterprise, that arrangements should be perfected to secure the great fruits which will flow from the early completion of the work."

The Baltimore Gazette says that the preliminary survey of the route from Pittsburgh to Chicago has been completed, and that a report giving a comparison of different routes and an approximate estimate of cost will soon be made public. It says that the line will be about 460 miles long, which is eight miles shorter than the Fort Wayne line, and that the cost of construction will

be less than \$20,000 per mile. The cheapness of the line is urged as a reason why it can afford to carry and make profits at low rates.

West Wisconsin.

A large force is at work on the road between Menominee and Hudson. The bridge over the St. Croix River at Hudson will be commenced very soon, and it is expected that the road will be completed to this point by the latter part of August. The engineers are now locating the line between Hudson and St. Paul.

The company have contracted with the Wason Car Company for 150 freight and passenger cars, one-half of which have been delivered and are now running on the completed portion of the road. The locomotives are furnished by the Baldwin Locomotive Works.

Illinois, Missouri & Texas.

This company, according to the St. Louis Journal of Commerce, succeeds the Cape Girardeau & State Line Company, which has 16 miles of grading done, from Cape Girardeau to the crossing of the Iron Mountain road. Twenty miles more are under contract. It is intended to build the road to a connection with the Cairo & Fulton road, somewhere near the Arkansas line. The company also have authority to bridge the Mississippi River at Cape Girardeau.

Plymouth, Kankakee & Pacific.

Proposals for the grading and bridging of 45½ miles of this line from Plymouth, Ind., westward to a point within ten miles of the Illinois line, will be received at the office of the Secretary in Plymouth, until May 25. Bids may be made for the whole or a part.

Oshkosh & Mississippi.

A Telegram from Oshkosh, Wis., dated the 17th, says: "The Board of Directors of the Oshkosh & Mississippi River Railroad Company have just let the contract for grading the bed of the route from Oshkosh and Ripon to Whalen & McGee, of La Crosse, at twenty-two cents per cubic yard for excavation. The men to whom the contract was awarded have just completed a contract on the Wisconsin Central road, from Menasha, and are said to be energetic railroad men. The work must be completed on or before August 15, and includes bridging, culverts, side track, etc. The aggregate amount of the contract will be about \$20,000. A portion of the road-bed was graded by the old Winnebago Railroad Company several years since. The iron will be in readiness to lay down early in July, commencing at Ripon."

Municipal Aid in Minnesota.

The Court of Common Pleas in St. Paul has rendered a decision in a case brought to prevent the collection of a tax to pay the interest on \$200,000 in bonds voted by Ramsey County in aid of the Lake Superior & Mississippi Railroad, in which it is held that all such votes of aid under the Constitution of Minnesota are void. The case is appealed, and the decision of the Supreme Court will be looked for with great interest, as on it will depend the success of many new projects.

The St. Charles Bridge.

The work is progressing without interruption and already a temporary flooring connects the banks to allow workmen to cross. It is expected to be ready for the trains by the first of June.

Portland & Ogdensburg.

The Portland Eastern Argus says "the track is laid within 8 miles of Farmington, and at the rate the work is being pushed it will reach Conway by the last of June. The road beyond Fryeburg is graded and ready for the iron. Sufficient iron is expected to arrive soon to lay the track to the State line. At present the demand upon the rolling stock for freight is nearly all that can be attended to, but they will find some relief soon by the filling of thirty freight cars at the Portland Company's works. They are having a very powerful freight engine built, and two new first-class monitor passenger cars, of a sixty-passenger capacity each, and nearly ready for the road. By the first of July the rolling stock of the road will include fifteen new passenger coaches, two new baggage cars and one smoking car."

Muscataine Western.

On the 17th inst. Muscatine voted by 728 majority in favor of a 5-per-cent. tax in aid of this road.

Monroe, Wayne & Holly.

The track is laid on this new road from Wayne, on the Michigan Central 18 miles west of Detroit, northward to Northville twelve miles, and an excursion train passed over it on the 17th inst. When completed this road will connect the Flint & Pere Marquette road with Toledo.

Toledo, Wabash & Western.

This company now runs a Pullman car from St. Louis through to Toledo on its way to New York, a Pullman from Quincy to Toledo, and a night car from Kansas City (via Quincy) to Toledo. It expects soon to run sleeping cars through from Toledo to Omaha. Its bridge over the Mississippi at Hannibal is to be completed in September.

Atlantic & Pacific.

By the terms of its land grant this company must complete its line to a point in the Indian Territory a little beyond the Grand River, nearly 25 miles from the point where it enters the Territory, by the 28th of July. It must construct 50 miles per year hereafter.

Leavenworth, Lawrence & Galveston.

The road is now, and has been for some time, in operation to Thayer, in Neosho County, 23 miles directly south of Humboldt and 108 miles from Lawrence. Twenty miles of road south of Thayer is located, and the engineering party has nearly completed the final location of the remainder of the distance to the Indian Territory line at Montgomery County. The road is to be completed ready for operation within the next ninety days.

LOCOMOTIVE STATISTICS.

From the reports of the master mechanics of the roads enumerated below the figures have been taken and tabulated for the sake of easy comparison.

FOR THE YEAR, 1870.											
NAME OF ROAD.	No. of Locomotives in service.	No. of Miles operated.	MILEAGE.				COST PER MILE IN CENTS.				AVERAGE COST OF FUEL.
			Passenger.	Freight.	Miscellaneous.	Total.	Passenger.	Freight.	Miscellaneous.	Total.	
Illinois Central	1,109	191	1,330,733	3,355,761	701,123	5,387,617	10.45	6.83	78.14	19.20	5.95
Toledo, Peoria & Warsaw	227	44					6.90	6.45	1.30	14.65	6.92
* In Illinois. † In Iowa.											
FOR THE MONTH OF FEBRUARY, 1871.											
Pacific of Mo.	355	97	812,511	906,259	494,345	2,213,115	3.90	14.00	1.10	19.70	5.80
Altogether Val.	132	35	23,365	43,423	2,922	70,709	7.39	5.47	.70	13.56	7.92
Chicago, Burlington & Quincy	698	151	100,330	144,356	92,994	337,670	14.86	9.50	1.08	25.44	7.85
FOR THE MONTH OF MARCH.											
Bur. & Mo. Riv.	450	53	14,497	66,634	25,684	133,735	5.70	9.00	0.70	15.40	7.70
Chicago, Burlington & Quincy	698	154	108,594	146,917	100,635	356,164	13.18	8.96	1.00	23.14	8.03
Pitts., Ft. Wayne & Chi. (E. Wayne)	319	137	79,830	242,743	9,161	331,734	4.43	5.87	.99	11.29	6.96
Hau. & St. Jo.	231	71	60,475	110,132	90,999	261,606	10.30	6.30	.90	17.40	7.40
Mich. Central	509	112	97,665	735,216	62,392	2,674,273	13.40	15.64	1.04	30.08	6.45
Central Pacific	1,020	120									

New Jersey Central Report.

The Central Railroad of New Jersey extends from Phillipsburg, N. J. (on the Delaware, opposite Easton, Pa.), eastward to Elizabethport, near the foot of Newark Bay, a distance of 64 miles, with a branch from Elizabeth to Jersey City, 10 miles. All of this has a double track, and 57 miles of it a third rail for a 6-foot gauge. The company also operates, under a lease, the South Branch Railroad from Somerville to Flemington, 15 miles.

TRANSPORTATION ACCOUNT.

The following is a statement of the ordinary receipts and expenses for the year 1870, compared with 1869:

RECEIPTS.			
	1870.	1869.	
Passengers.....	\$1,118,147 21	\$967,657 91	
Merchandise.....	1,172,87 63	1,180,598 73	
Coal.....	1,954,550 56	1,737,991 66	
Mail.....	15,772 40	15,772 40	
Express.....	28,736 10	70,379 60	
Rents.....	80,900 36	41,377 91	
Miscellaneous.....	22,486 87	26,343 52	
Total receipts....	\$4,393,514 12	\$4,010,121 73	
EXPENSES.			
Running expenses.....	\$790,066 85	\$742,456 61	
Wood consumed.....	47,961 66	75,848 64	
Coal consumed.....	240,117 12	280,240 79	
Repairs of road.....	4 5,522 17	453,900 45	
Repairs engines.....	216,211 73	260,706 21	
Repairs passenger cars.....	59,657 03	63,452 53	
Repairs freight cars.....	23,750 99	40,692 01	
Repairs coal cars.....	40,705 50	76,191 05	
Repairs docks, Elizabethport.....	20,262 13	22,046 11	
Repairs buildings, bridges, etc.....	175,486 25	146,693 58	
Repairs tools and machinery.....	18,875 80	23,023 73	
Expense account.....	103,811 10	99,430 88	
Miscellaneous expenses.....	105,341 58	70,282 95	
Ferry running expenses.....	106,555 33	115,975 47	
Ferry boat repairs.....	41,995 62	28,307 11	
Ferry miscellaneous expenses.....		483 00	
Car service.....	126,654 68	130,500 25	
Total expenses.....	\$2,512,216 64	\$2,612,163 37	

An increase of receipts is here shown of \$383,392.39, or 9½ per cent. The increase in passenger receipts was \$160,389.29, or 17 per cent.; and in coal receipts, \$216,558.90, or 12½ per cent. There was a decrease in merchandise receipts of \$7,228.10, or 1 per cent.

The expenses show a decrease of \$129,946.73, or 5 per cent. There has been an increase in running expenses of \$55,448.24; in repairs of buildings, machinery, etc., of \$23,860.85; and in general expenses, of \$39,338.85. There has been a decrease in repairs of road of \$48,378.38; in fuel consumed, of \$77,010.64; in car service, of \$3,845.57; in repairs of equipment, of \$121,316.55, and in ferry expenses, of \$43.63.

The gross receipts per mile run have been as follows: From passenger trains, \$1.28 against \$1.16 in 1869; from merchandise trains, \$2.04 against \$1.90; from coal trains, \$2.36 against \$2.27. The average receipts per mile run from all trains have been \$1.87 against \$1.81 the previous year.

The gross expenses per mile run have been \$1.07 against \$1.19 the previous year.

The cost of the railroad double-tracked, with its coal wharves, station houses, shops, and other appendages, stand at \$10,630,122.60, and that of the equipment at \$2,674,000.

The company has found its experiments with steel rails so successful that it has decided to relay the main tracks entirely with steel, and has ordered for this year 5,000 tons.

A branch is to be built forthwith across the meadows east of Elizabeth from the main line near Elizabethport to the Newark Branch, to give an outlet in case of accident to the bridge over Newark Bay, which has heretofore once or twice severely delayed traffic.

The Delaware, Lakawanna & Western Company is charged with violation of contract in diverting its business from the Central to the Morris & Essex, and suit is threatened for damages.

The bonded debt was reduced from \$3,400,000 to \$3,231,000 during the year.

"Since the close of the year 1870 a most important negotiation has been commenced and perfected for the

lease of the Lehigh & Susquehanna Railroad and branches. This road extends from the terminus of the Central at Phillipsburg, up the Lehigh Valley, and across the mountain range into the Wyoming Valley, the main road being 105 miles in length, while the branches, sidings and double track, bring the length of track up to 252½ miles. The contract is perpetual, and practically carries the terminus of the road into the heart of the finest Lehigh and Lackawanna coal regions, with a certain command of a steady supply of coal from the extensive coal lands owned or controlled by the Lehigh Company. Printed copies of the lease will be sent to the stockholders. Attention is drawn to the fact that as the Lehigh Coal & Navigation Company receive as rent one-third of the gross receipts, this company incur no liability except for business actually done. The risk of freshets also is taken by the lessors, and not by this company. The entire equipment of the road, consisting of 72 engines, 15 passenger cars, 10 baggage cars, 554 freight cars, 10,442 coal cars and 263 other cars, is also purchased at valuations amounting to \$3,632,750. All this equipment is new or nearly so, uniform in style and make, and corresponds with the Central cars and engines, so that much expense in maintaining will be avoided. Payment for this equipment is made by the assumption of \$2,310,000 of the Lehigh six-per-cent. loan, due in 1897, and of the outstanding balances of the two Lehigh car trusts; so that the purchase requires no immediate payment of heavy sums, but can be made to suit the convenience of the treasury.

"The road is in excellent order, especially the part from Phillipsburg to Mauch Chunk, which is laid entirely with steel rails, while the masonry and other work are of the first character. Most of the curves on the upper road are also laid with steel rails. The planes at Wilkesbarre for raising the coal from the Wyoming Valley to the top of the mountains are entirely new, a complete success, and greatly reduced the cost of transporting coal from that region. In fact, no expense has been spared by the Lehigh Coal & Navigation Company to make their road as perfect as possible. It is believed to be a contract fair and advantageous to both parties, and likely to work well. It goes into operation on the 1st of April, and this report has been somewhat delayed so as to announce the fact of the lease to the stockholders."

BALANCE SHEET, JANUARY 1, 1870.

Railroad	\$7,764,112 25
Jersey City station	964 48 10
Port Johnston coal station	695,076 01
Elizabethport station	300,145 19
Station houses, shops and water stations	546,035 39
Ferry interest and boats	574 46 10
Engines	1,193,000 00
Passenger and baggage cars	507,000 00
Freight cars	316,000 00
Coal cars	628,000 00
Land, docks, machinery, miscellaneous property, etc.	1,400,000 00
American Dock and Improvement Co. stock	1,500,000 00
Newark & New York R. R. Co.	705,217 17
Chairs, spikes, iron rails and ties, on hand	74,025 61
Materials and fuel on hand	178,072 25
Cash and accounts receivable including balance due by Land Co.	2,310,056 53
Capital stock	\$19,799,043 35
First mortgage bonds, due 1870	\$140,000 00
Second mortgage bonds, due 1875	254 00 00
Mortgage bonds of 1890	2,337,000 00
Interest on bonds, accrued not yet due	\$3,231,000 00
Accounts payable	90,500 00
Renewal fund	1,467,605 70
	9,937 65
Total	\$19,799,043 35

The Directors of this company are John Taylor Johnston, John C. Green, Adam Norrie, Sidney Dillon, James Boorman Johnston, New York; Benjamin Williamson, Elizabeth; F. T. Frelinghuysen, Newark; Henry D. Maxwell, Easton, Pa.; Asa Packer, Mauch Chunk, Pa.

John Taylor Johnston is President; Samuel Knox, Secretary and Treasurer; R. E. Ricker, Superintendent and Engineer, and James Moore, Consulting Engineer.

Louisville & Nashville.

The stockholders of this company met on the 3d inst. and authorized the officers to lease the Nashville & Decatur Railroad, and make such contracts for the completion and control of the North & South Alabama, as are best for the interests of the Louisville & Nashville road. A resolution was also adopted to guarantee and endorse \$3,500,000 seven per cent. 30-year bonds of the Memphis & Ohio Railroad.

Cincinnati, Hamilton & Dayton Report.

This railroad company owns a railroad between Cincinnati and Dayton, O., 60½ miles long; it operates under a lease the Dayton & Michigan Railroad, extending from Dayton north by east to Toledo, 141½ miles, and the Cincinnati, Richmond & Chicago Railroad, from Hamilton, O., northwest to Richmond, Ind., 42 miles. The total mileage operated is thus 243½ miles. It has a third rail for a 6-foot gauge track, of which the Erie Railway has the exclusive use at a rental of \$180,000 per year.

From the report for the year ending March 31, 1871, we extract the following:

INCOME.	
From passengers	\$430,452 31
Freight	544,149 78
Mails and express	23,577 83
Rents from other companies	210,000 00
Rent of machinery	22,600 43
Interest	30,813 81
Miscellaneous	8,937 83
Total	\$1,370,631 98
EXPENSES.	
For operating	\$627,205 93
Taxes and insurance	54,386 48
Interest on bonds	144,900 00
Total	\$826,592 41
Leaving as net earnings for the year	\$544,039 57
Out of which two dividends have been deducted—No. 30, Oct. 24, 1870	\$140,000 00
No. 31, April 4, 1870	280,000 00
Amount carried to surplus account	163,949 57
Making balance to that account	539,874 51

The operating expenses have been 49 36-100 per cent. of the gross earnings.

Earnings per mile \$21,177 43
Number of passengers carried 753,787
Number of tons of freight moved in narrow-gauge cars 496,039

Net earnings have been 12 68-100 per cent. on the capital stock, out of which two cash dividends have been paid to the stockholders of four per cent. each, free from government tax.

The President describes a modification of the lease of the Dayton & Michigan road, by which the stockholders of the latter are to be guaranteed 3½ per cent. per annum, which will not be more than \$35,000:

"The Cincinnati, Richmond & Chicago Railroad, at the commencement of this year's business, was not paying expenses. On the 1st of August, however, the Chicago business of the company was transferred from the Lima route to that via Richmond, and in return therefor the Pittsburgh, Cincinnati & St. Louis Railway Company gave us a share of their business, they remaining neutral between our roads and the Whitewater Valley Division of the Indianapolis, Cincinnati & Lafayette Railroad Company. But since the 1st of December they have been sending their business by our line, and our Richmond Branch has been increasing its earnings, so that it will be able, not only to pay expenses, but to at least partially repay the Cincinnati, Hamilton & Dayton Railroad Company for the advances made during the past two years in its behalf. The future prospects of the company are now encouraging."

The President speaks of the project of the Vanderbilt interest to construct a new line between Cincinnati and Dayton, lease the part of the Cincinnati, Sandusky & Cleveland road between Dayton & Springfield, and with the line so formed and the Cleveland, Columbus, Cincinnati & Indianapolis northeast of Springfield, open an independent route between Cincinnati and Lake Erie, as likely to be carried out and become a competitor for a portion of his company's business; but he expresses confidence in the capacity of the Cincinnati, Hamilton & Dayton to make a good income in spite of such competition.

A committee of stockholders appointed to examine the road report it and its shops in good condition, recommend the construction of some coal-burning locomotives, the building of a coal elevator in Cincinnati, and a grain elevator with capacity for 300,000 bushels in Toledo.

Memphis & Little Rock.

The report of the General Superintendent for the year 1870 gives the following figures:

The receipts were:	
From passengers	\$100,733 19
From freight	61,179 09
From other sources	7,913 47
Total cash receipts	\$169,825 75
For mail service credited on purchase of property from the United States	10,651 76
Total	\$180,477 51
The expenditures have been:	
Conducting transportation	\$55,768 19
Motive power	52,130 10
Maintenance of way	81,721 18
Maintenance of cars	14,578 08
Excess of expenses over receipts	\$23,730 04

The entire line is 131 miles, but during 1870 the sections operated were from the Mississippi to the St. Francis, 38 miles, and from Little Rock to Duvall's Bluff, 48 miles, and during the first five months of the year the road was only partially operated, and there

was in that time an excess of nearly \$30,000 in expenditures over receipts on the Eastern Division.

The Superintendent says:

"Much has been said about the overflow on the Eastern Division. No one need apprehend any difficulty from that cause, as it is simply necessary to raise the track in a few places which overflow in extreme high water. I guarantee that with three hundred hands put to work the track can be placed above overflow in five months, and no interruption to the running of trains. The company would have done this long since, except for the importance of first completing the Middle Division."

He recommends that steamer lines be run in connection with the railroad on White River north of Duvall's Bluff, and on the Arkansas above Little Rock, and expresses his belief that the completed road will take in an average of \$2,000 per day, which, however, is less than \$6,000 per mile of road.

Lehigh Coal and Navigation Company's Report.

This company owns the Lehigh & Susquehanna Railroad, extending from Easton, Pa., by a somewhat circuitous route to Green Ridge, two miles beyond Scranton, 120 miles, with three branches aggregating 30½ miles, and a leased line (Bethlehem to Chapman) 15 miles long. It owns also a canal from Easton to Coal Port, two miles north of Mauch Chunk, 48 miles; and leases the Delaware Division Canal, from Easton down the Delaware River to Bristol, Pa., 23 miles above Philadelphia, 60 miles long. It also owns extensive coal mines.

The following is extracted from the report of the Board of Managers for 1870:

"The profits of the year from all sources were:

Net profits on railroads, including car service.....	\$819,815 83
Net profits on Lehigh Canal.....	177,637 92
Net profits on coal:	
Summit mines.....	\$26,402 49
Newport mines.....	15,454 20
Net profits from real estate sold.....	41,856 69
Net profits from rents.....	82,206 37
Miscellaneous receipts.....	57,004 59
	21,538 96
	\$1,200,060 21

Less general expenses.....	\$122,245 18
Taxes.....	194,144 42
Balance of interest account for 1870.....	1,054,341 52
Loss on Delaware Division Canal.....	127,020 61
	1,497,751 73

Deficit.....\$297,691 52

"The past year has been one of the most unsatisfactory in the experience of the company since the disasters of 1862. Our profits are dependent almost entirely on the general condition of the coal trade, which, during last year, was unremunerative to nearly every company and operator engaged in it. With low rates on the railroad, frequent breaks in the canals during the spring, and a six months' suspension at our mines, we find full reason for the small amount of our net receipts."

"The amount of coal transported by the railroad shows an increase of 585,264 tons over the previous year, or after deducting deliveries to the canal and to points and railroads above Mauch Chunk the increase was 186,791 tons. While the gross receipts derived from all of the traffic of the roads were larger, by 9-17 per cent. than in 1869, the expenses were increased 18½ per cent. and the net earnings, after deducting taxes and half of the general expenses, were \$734,359.85, or 33 8-10 per cent. of the gross receipts, against \$812,802.94, or 39½ per cent. in 1869, which difference is accounted for by the charge of coal being 1 65-100 cents per ton per mile in 1870, against 2 cents in 1869, while the number of trains was considerably increased."

Organization of Railroad Service in Germany.

A correspondent of the London *Railway News*, writing from Hamburg, says:

The directors of the Association of German Railways are now engaged in working out the details of a plan to be laid before the next railway conference for regulating on one general footing, common to all, the principle of promotion and pensions, which is conceived in a very liberal spirit, and is highly favorable for the interests of that meritorious but badly-paid class of public servants, on whose activity and presence of mind so many precious lives and so much valuable property every day depend for safety—the railway officials and servants. As in the case of the Post Office and Telegraph departments, so each railway company will have its own staff of functionaries, with claims for promotion in case of a vacancy in a higher class, caused by death, dismissal, or retirement from active service. The officials on all railroads are to have the same rank and title by which their functions will be designated, and the lowest salary is to be fixed at 600 florins per annum. It is to be expected that this last item will give rise to serious opposition, inasmuch as it will be very difficult, if not utterly impracticable, to make one rate of pay, though the service they have to perform be identical; because the expenses of living, house-rent, and other items, vary so much according to the locality. Thus, for instance, it would be absurd to pay an official, obliged to live in a large city like Berlin or Hamburg, at the same rate as in a little, quiet, out-of-the-way country town like Wittenberg or Lüneburg, to say nothing of the difference in the prices of everything between the States of North and South Germany. It is further proposed that as a general rule promotion shall go by seniority and length of service, and that special preference appointments to vacancies shall only be made in exceptional cases and for meritorious services,

and then only at a plenary sitting of the board of directors, to be held not less than three months after the vacancy has occurred, so as to avoid the charge of undue favoritism, which causes so much bitter feeling and disappointment in the service.

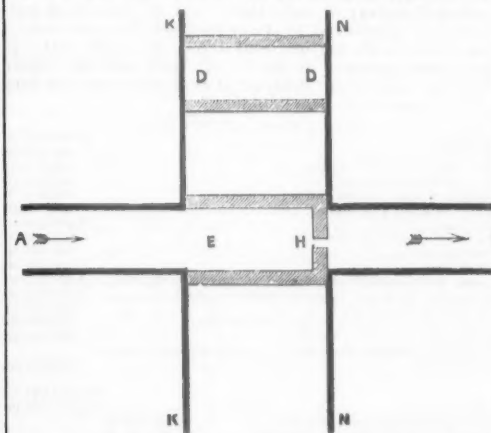
A Tubular Postal Service.

BY WILLIAM H. HARRISON.

Some large iron pipes have just been laid from the General Post Office to the Branch Office at Charing Cross, through which pipes packages of letters are blown in either direction at will, by compressed air. These tubes are to be extended from Charing Cross to the Houses of Parliament; and when the total expenses of laying pipes and of transmitting small packages through them is known by experience, very possibly the system may be extended, and letters intended for quick delivery may be sent by this method at a moderate charge.

The plan of sending messages through pipes for short distances has been employed in the city for many years in connection with the late Electric & International Telegraph Company. Seventeen or eighteen years ago, Mr. Latimer Clark laid down tubes from the central office of the company in Lothbury to the telegraph offices in Cornhill and Mincing Lane. By means of a steam engine, which worked a great air-pump, messages inclosed in small gutta-percha carriers, each somewhat resembling a sausage in shape and size, were drawn from Cornhill and Mincing Lane to Lothbury. Additional and smaller pipes were afterwards laid down by him, so that the vacuum could be applied to the further ends of the carrying pipes, in order that messages might be sent in the opposite direction also. They were then easily transmitted to and from Cornhill, but the Mincing Lane station being two-thirds of a mile off, it was found that the friction of the air in the pipes was too great, so that carriers could be sent in one direction only, namely, from Mincing Lane to Lothbury. Some years later, when Mr. C. F. Varley became engineer to the International Telegraph Company, he employed compressed air to drive carriers to out-stations, and a vacuum to bring them back again. When a vacuum is employed, the carriers are driven by the ordinary atmospheric pressure only of fifteen pounds to the square inch, but when condensed air is employed, almost any pressure may be applied, so that the carriers can be driven with enormous velocity. He also substituted felt for gutta-percha carriers, since the latter were sometimes partially melted by the heat occasioned by friction, and coated the insides of the pipes with sticky matter. Further, he designed some pneumatic valves; the carriers, on arriving at the end of their journey, were made to strike against a brass button, the motion of the button set a valve to work, the valve opened the door of the chamber at the end of the pipe, the carrier then fell out, and dropped down on the table below. Thus the carriers were made to let themselves out when they arrived at the end of their journey, by which plan much hand labor on the part of assistants was saved. These improvements worked well, and are working well at the present time. Seven or eight city telegraph stations have been thus pneumatically connected for many years.

But a further improvement in the system has been made within the past year or two by Mr. C. W. Siemens. He lays down the pipes in circuits, and has pressure in the rear, and a vacuum in front of each carrier, so that as the motive forces all act in one direc-



tion, there may be several carriers flying through the tubes at the same time. If these carriers were not stopped anywhere, they would all find their way back to the central station. He has invented also a "shunt," whereby any intermediate station can stop its own carrier, and pick it out of the tube without interfering with the motion of other carriers which may be flying through other parts of the circuit. Suppose the carriers to be three minutes apart in point of time, and that five stations are on the circuit, each station knows at what time its own carrier is due, so is able to take it out without interfering with other carriers. If the carriers be not sent at regular intervals of time, the receiving station can be told when its carrier is started, by telegraph. The plan of picking out the carriers is simple, and the principle may be explained by the aid of the accompanying diagram. *AH* is the main tube, and the direction taken by the carriers is denoted by the arrows; *KK* and *NN* are metal plates, between which the two short tubes *DD* and *HH* slide in an air-tight manner. These two short tubes are attached to a lever-joint. When the assistant does not wish to intercept a carrier, the tube *DD* is left in the place occupied by the tube *EH* in the cut, and *DD* being open at both ends, carriers pass through it without interception.

Upon sliding *EH* into the gap in the main tube, however, the carrier is stopped by it. It is brought to a standstill very gently, because it compresses some air in front of itself, which air issues with restricted freedom through the hole *H*; thus the carrier makes for itself an air-cushion to break the violence of the blow. When the carrier is caught, the tube *DD* is brought into the line of the main tube, after which an air-tight door in the side of *EH* is opened, and the captured carrier, with its message, is taken out.

For short distances to and from telegraph stations near the Bank and the Post Office, the pneumatic tubes are from one and a half to two and a half inches in diameter; they vary in diameter according to distance. But the one large Siemens circuit at present laid in London goes from Telegraph street to Charing Cross and back, the General Post Office and Temple Bar office being the intermediate stations; this pipe is three inches in internal diameter. The carriers travel at the rate of about a mile in three minutes, but the rate varies with the pressure.

It may be asked why these pneumatic tubes are useful in connection with telegraph offices? The fact is, that there are many disadvantages in sending messages very short distances by the electric telegraph. Suppose one telegraphic wire be suspended between two stations half a mile apart, and another be suspended between two stations three hundred miles apart; let thirty messages be received all at once for transmission over each of these two wires, it is plain that some of these messages will have to wait half an hour before their turn comes to be signaled over the wire. The public will not complain of a delay of half an hour in the delivery of a message in a town three hundred miles off, but they would make a great outcry if a message took half an hour to go half a mile by the electric telegraph. Therefore, it is the simplest and most expeditious plan for the central telegraph station in a great city to blow messages bodily through tubes, to branch stations not far off; the plan saves time and saves labor. Complaints published in the newspapers about delays in telegraph messages, refer for the most part to telegrams sent from one part of London to another, and the delays are often caused by the pressure of a sudden influx of work upon particular wires.—*Nature*.

Western Union Telegraph Improvements.

The *Journal of the Telegraph* (the organ of the Western Union Company) enumerates, as follows, the additions and improvements to the property of the company to be made this year:

"The active work of 1871 has now fairly begun. A new large wire, No. 6, is being erected between New York and Chicago, on which may be used the printing instrument, with its greater capacity for speed. New wires are also being erected between New York, St. Louis, New Orleans and other cities. A new line of three wires is being finished on the Mobile & Chattanooga Railroad, between New Orleans and Mobile. The same road is being extended rapidly west of the Mississippi, on which a new line will be constructed, and to which the present line through the swamps of Louisiana will be removed. A line from Indianola via Corpus Christi, to Brownsville, has been ordered, and will be completed this summer. It will connect with the Mexican Government lines from the City of Mexico to Matamoras, and thus bring all parts of the United States, and indeed of the commercial world, in direct telegraphic connection with the principal cities of Mexico. A contract has just been executed with the International Railway of Texas for a line along that railway, which will extend from the northeast corner of Texas to Laredo, on the Rio Grande. Another is about being concluded with the Great Northern Railway of Texas, running north from Houston to meet the road now in process of construction south through the Indian Territory. The line on the new railway, Little Rock to Fort Smith, will be completed within a few weeks. Heretofore, the telegraph system in Texas has had but one outlet—that by way of the line through Louisiana to New Orleans. By the completion of the lines above-named, Texas will have three additional connections: one via Marshall and Shreveport to Vicksburg; another, Fulton and Little Rock to St. Louis or Memphis; and the third, north via Fort Scott or Kansas City. On the Pacific coast telegraphic extension is progressing steadily. The lines south of San Francisco now reach San Diego, with branches connecting several new points on the coast. A contract has just been concluded with the California & Oregon Railroad Company, whose road is now in process of construction between San Francisco and Portland, by which the present line extending to Oregon, Washington Territory, and British Columbia, will be transferred to the railroad as fast as completed, and an additional wire will be erected, to provide for the rapidly increasing business of that section. Other lines, some of them important, are projected, and will probably be commenced during the year. The present indications are that more lines will be constructed by the Western Union Company and its tributaries during the current year than the total of all those now being operated as competing lines."

PUBLISHER'S ANNOUNCEMENTS.

The Railroad Gazette.

"One of the most useful publications of the kind in the country. To all railroad officials it must be invaluable.—*Richmond Whig*."

"The leading journal of this class."—*Seneca (Ka.) Courier*.

"Occupying the foremost position as a railroad journal."—*St. Louis Republican*.

—The first droves of Texas cattle of the season have arrived at Baxter Springs and Abilene, and been shipped eastward.